*Tidal creek system. Photo by Martin Stock / LKN.SH.*

# Swimway Vision and Action Programme 2026-2032

Adopted by the Wadden Sea Board on 20 November 2025

Authors: Expert Group Swimway

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# Imprint


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## 1. Preamble

Fish are vital to the Wadden Sea ecosystem, both as predators and prey, transferring considerable biomass and energy top-down and bottom up through the food web of the Wadden Sea and connecting water bodies of the rivers and the North Sea. Many fish species rely or even depend on the Wadden Sea to pass during migration, or as crucial feeding and spawning ground. However, many populations of fish have declined in recent decades, for example those that use the area for the early part of their life-cycle such as flatfish as well as all diadromous species, changing their habitat between fresh and salt water for reproduction, emphasising the need for targeted fish conservation, employing a perspective on life cycles and the ecosystem.

To address this, Danish, Dutch, and German experts developed the Trilateral Fish Targets, adopted in 2010 as part of the Wadden Sea Plan. These targets were specified and translated into the Swimway Vision 2018-2024, which was endorsed at the Leeuwarden Conference 2018 (Annex 3, Leeuwarden Declaration), with 25 stakeholder organisations from Denmark, Germany and the Netherlands pledging support and marking the start of the Swimway Vision.

For realising the Swimway Vision, the Trilateral Swimway Vision and Action Programme (SVAP) has been formulated to outline steps to operationalise the Fish Targets. Its first term, from 2019-2024 has been adopted and extended to 2026. The SVAP is implemented by the Expert Group Swimway (EG-S), facilitating trilateral exchange between Dutch, German and Danish scientific representatives, responsible authorities and NGOs. EG-S offers a platform to bring together national, bilateral or trilateral initiatives instrumental in achieving the implementation of trilateral fish targets for the Wadden Sea area. See also Wadden Sea Swimway microsite.

The Swimway Vision and Action Programme operationalises the implementation of trilateral objectives of the SIMP Integrated Management Plan for One Wadden Sea World Heritage while supporting the protection of the Wadden Sea's Outstanding Universal Value (OUV) and safeguarding the sustainability of uses in the Wadden Sea. In addition, the Integrated Management Plan highlights species conservation and ecological connectivity across the trilateral states as key priorities. SVAP provides the framework for fish-related measures, facilitating the realisation of these goals through collaborative conservation efforts and enhanced stakeholder knowledge sharing and communication.

The SVAP 2026-2032, developed by EG-S builds on the Swimway Vision and Action Programme 2019-2026. For implementing trilateral fish targets, the SVAP applies the life cycle approach with special reference to obstacles to closing the life cycle, the so-called bottleneck, as outlined in the previous SVAP. The actions and recommendations described in this Action Plan are based on the work of the Expert Group in the past years as well as the group's expert knowledge and aim at supporting the trilateral community involved in working on fish in the Wadden Sea region. They are not necessarily actions for the EG-S itself to carry out but should rather be used as

recommendations for the authorities mandated and thus responsible to protect fish. Funding still needs to be secured, and the suggested budgets in the list of actions are indicative. There is no commitment by parties yet.

The SVAP 2026-2032 underwent a national consultation process by the members within the EG-S and was adopted by the Wadden Sea Board on 20 November 2025.

## 2. Introduction

With 162 known species (Berg *et al.* 1996) the fish community of the Wadden Sea is exceptionally diverse due to the convergence of marine species from the North Sea and diadromous species from the estuaries meeting in the Wadden Sea. While most fish in the Wadden Sea are marine species that primarily inhabit the North Sea, some spend the majority of their lives within the Wadden Sea itself, and others utilise it as a stopover along their migration routes. Additionally, diadromous species start their life in freshwater environments, spend their adult life in the sea and return to freshwater to spawn, or, in the sole case of eel (*Anguilla anguilla*), vice versa. Some species use seagrass beds, saltmarshes or other habitat types as a nursery ground, using and coping with the fluctuating conditions of this dynamic environment, formed by wind, waves and tides.

The populations of many fish species in the Wadden Sea have declined in recent decades (van der Veer *et al.* 2015, Tulp *et al.* 2022), and the causes of these declines are only partly known or understood. Formerly typical elements of the Wadden Sea fish fauna such as sharks, rays and cod are today largely absent, and the nursery function provided for juvenile plaice and sole, both characteristic for the Wadden Sea, has declined (van der Veer *et al.* 2015, Tulp *et al.* 2022). Processes and developments well outside the Wadden Sea can have profound impacts on the life cycles of species being part of the fish community in the Wadden Sea.

According to Danish, German and Dutch red lists, there are 17 endangered fish species in the Wadden Sea area: river lamprey (*Lampetra fluviatilis*), sea lamprey (*Petromyzon marinus*), twaite shad (*Alosa fallax*), European eel (*Anguilla anguilla*), North Sea houting (*Coregonus oxyrinchus*), Atlantic salmon (*Salmo salar*), sea stickleback (*Spinachia spinachia*), greater pipefish (*Syngnathus acus*), snake pipefish (*Entelurus aequoreus*), greater weever (*Trachinus draco*), poor cod (*Trisopterus minutus*), transparent goby (*Aphia minuta*), piked dogfish (*Squalus acanthias*), tope shark (*Galeorhinus galeus*), starry smooth-hound (*Mustelus asterias*), common stingray (*Dasyatis pastinaca*) and thornback ray (*Raja clavata*).

The Swimway approach, and the protection of fish, goes well beyond the notion of fish migrating between the river and sea or from offshore waters to the coast and vice versa. It also relates to movements of all life stages nested in different spatial scales: across several 100s of kilometres larvae drift or, later in their development, move actively from their spawning grounds and aggregate in their coastal nurseries, where they switch between available habitat patches according to biotic (predators, feeding, intra- and interspecific competition) and abiotic (availability of physical habitat, tides, currents, temperature distribution etc.) conditions. Adult fish species living their entire life cycle in the Wadden Sea or migrating there to spawn may have different habitat requirements but are still vulnerable to interruption of their life cycle, be it through limited spawning substrate, poor growth environments, food shortage or direct sources of mortality such as predation or certain human activities. In this strategy we focus on the trilateral cooperation but also provide incentive for protection of key areas affecting fish in the Wadden Sea.

## 3. Overview

The figure below shows the different elements of the Swimway Vision and Action Programme and how national initiatives can feed into the Action Programme.

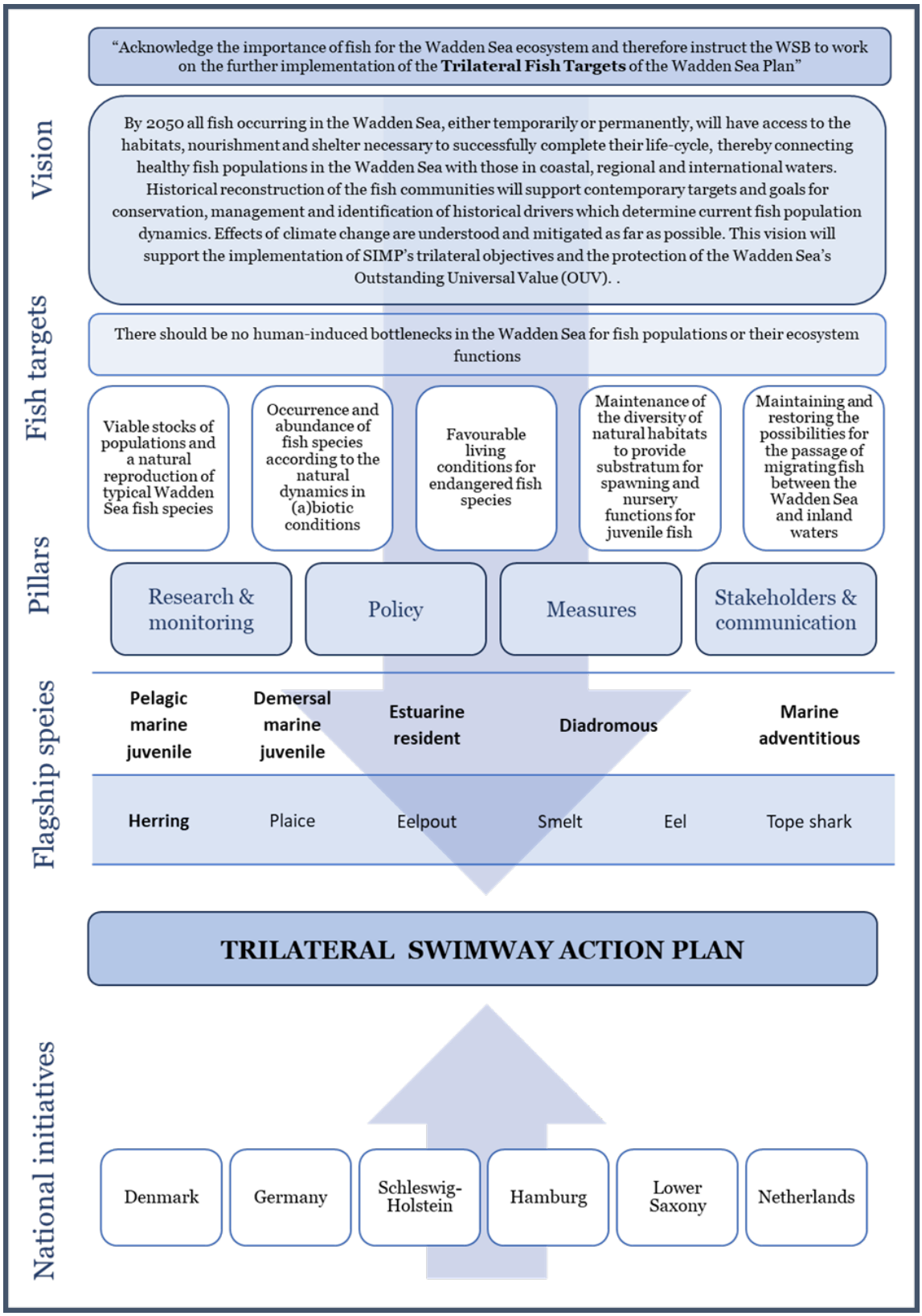


*Figure 1. Overview of the elements of the SVAP and the pathways through which national initiatives drive the Trilateral Swimway Action Plan.*

## 4. Vision

*By 2050 all fish occurring in the Wadden Sea, either temporarily or permanently, will have access to the habitats, nourishment and shelter necessary to successfully complete their life-cycle, thereby connecting healthy fish populations in the Wadden Sea with those in coastal, regional and international waters. Historical reconstruction of the fish communities will support contemporary targets and goals for conservation, management and identification of historical drivers which determine current fish population dynamics. Effects of climate change are understood and mitigated as far as possible. This vision will support the implementation of the trilateral objectives of the SIMP Integrated Management Plan for One Wadden Sea World Heritage and the protection of Wadden Sea's Outstanding Universal Value (OUV).*

## 5. Fish Targets

Fish are an integral part of the Wadden Sea ecosystem, facilitating the flow of energy and matter up and down the food web. Many marine and estuarine fish species depend on the Wadden Sea at some point in their life cycle. The majority of these species spend only part of their lives in the Wadden Sea, as juveniles to feed and grow, or as adults to spawn or search for food, or en-route between marine and freshwater habitats. In recent decades, there has been a notable decline in the populations of many fish species in the Wadden Sea due to largely unknown reasons. As fish are an important part of the Wadden Sea ecosystem the authors of the QSR (2009) proposed fish targets for the Wadden Sea, which were adopted as part of the revised Wadden Sea Plan (WSP) in 2010 (CWSS 2010) – the so-called Trilateral Fish Targets (see Wadden Sea Swimway microsite).

These Fish Targets are:

1. Viable stocks of populations and a natural reproduction of typical Wadden Sea fish species;
2. Occurrence and abundance of fish species according to the natural dynamics in (a)biotic conditions;
3. Favourable living conditions for endangered fish species;
4. Maintenance of the diversity of natural habitats to provide substratum for spawning and nursery functions for juvenile fish;
5. Maintaining and restoring the possibilities for the passage of migrating fish between the Wadden Sea and inland waters.

Fish experts conduct a regular assessment of the trilateral targets in the Wadden Sea Quality Status Report (QSR; Vorberg *et al.* 2005, Jager *et al.* 2009, Tulp *et al.* 2017, 2022). An **overarching target** for fish conservation in the Wadden Sea was described by authors of the 2017 QSR Thematic Report on Fish (Tulp *et al.* 2017):

*There should be no human-induced bottlenecks in the Wadden Sea for fish populations or their ecosystem functions.*

## 6. Life-Cyle Approach

Based on1 occurrence patterns, feeding and reproduction behaviour, Elliott *et al.* (2007) defined functional guilds to increase the understanding of the use of estuaries by fishes. The grouping of species for the Swimway programme was inspired by this approach. Species were identified per guild and grouped into focal species ("flagship species") and representing others with a similar lifestyle ("fleet species") (see Table 1 below & Swimway microsite). Considering the differing ecological role of the separate guilds, it is possible to identify specific actions directly related to each flagship and corresponding fleet species.

*Table 1. Flagship and fleet species of fish for the Wadden Sea.*

| Pelagic marine juvenile | Demersal marine juvenile | Estuarine resident | Diadromous | | Marine adventitious |
|---|---|---|---|---|---|
| Herring | Plaice | Eelpout | Smelt | Eel | Tope shark |
| Sprat, anchovy, horse mackerel, seabass | Sole, dab | Gobies, sand eel, sea snail, rock gunnel, mullets, hooknose | Twaite shad, salmon, sea trout, houting | | Thornback ray, dogfish |

## 7. Pillars

The Action Programme and Vision is based on four pillars: research and monitoring; policy; measures; stakeholder involvement; communication and education (see Wadden Sea Swimway microsite).

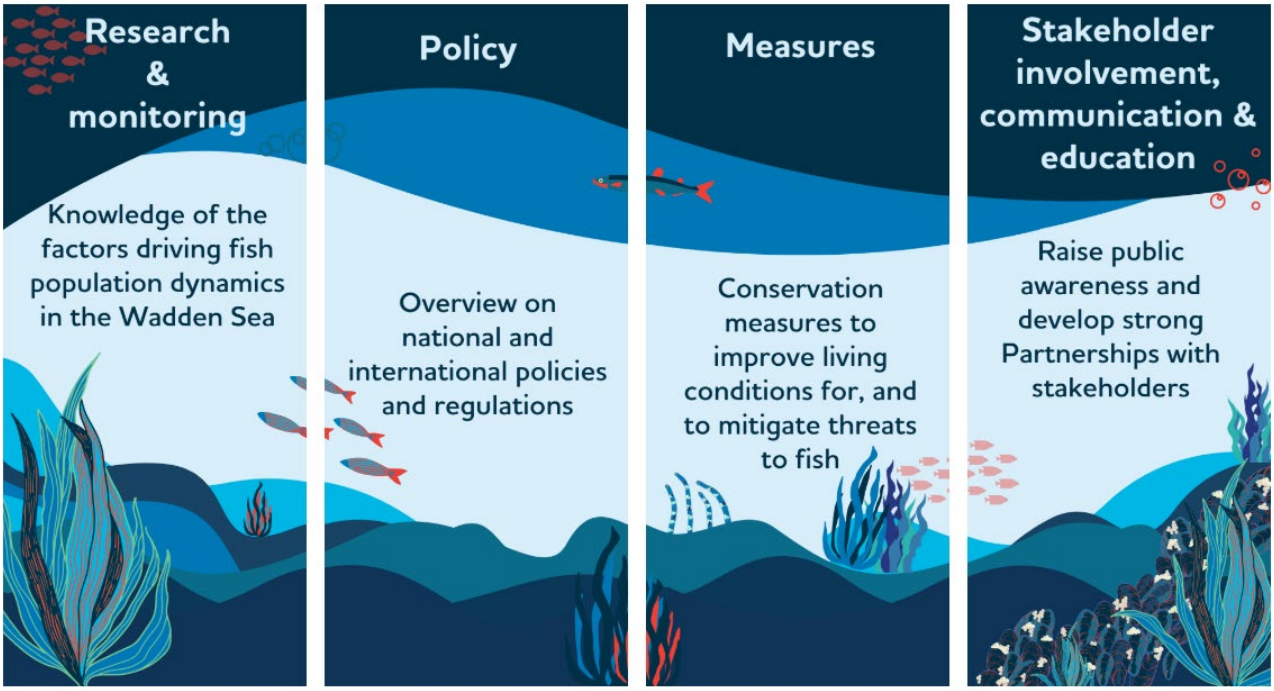


*Figure 2. Four pillars of the Trilateral Wadden Sea Vision and Action Programme.*

## 7.1 RESEARCH & MONITORING

### General Approach

The main objective for the Swimway research approach will be the identification of population bottlenecks and the translation of this knowledge into effective management and conservation measures. Closing these knowledge gaps will help to improve effectiveness of conservation efforts. In order to do this, the EG-S will facilitate trilateral exchange between Dutch, German and Danish research institutes, as well making connections with national, bilateral and/or trilateral initiatives, including trilateral and national research agendas. Collaboration will be sought with trilateral working groups such as the trilateral Expert Group Climate Change Adaptation (EG-C).

### Future Topics

Research

In order to evaluate the state of fish populations in the Wadden Sea, an assessment framework is required against which to evaluate the effectiveness of measures. This should go beyond the interpretation of the trend analyses made in the QSR and should be directly related to the fish targets. A fish assessment for the Wadden Sea could incorporate species-specific assessment of fish population status (declining, rising, stable, all three including the adult population of juveniles found in the WS), stressors (climate change, fisheries, obstruction of migration routes, dredging, etc.), and mitigation measures (see measures). In addition – where possible – information on the condition of biotopes as possible essential fish habitats and on food availability should be included in the assessment. Based on this, it is suggested to develop a suite of indicators for the implementation of the fish targets in order to assess if the targets have been met; these will also enable the evaluation of the effectiveness of measures.

Create bottleneck map and/or overview of mortalities and sub-lethal bottlenecks along the life-cycle.

Carry out a historical reconstruction of the Wadden Sea fish assemblage to support contemporary targets and goals for conservation, management and identification of historical drivers which determine current fish population dynamics.

Initiate a plan to address Activity 5 under the Key Topic "Fisheries" within the SIMP Integrated Management Plan for One Wadden Sea World Heritage:

- **Activity 5**. The TWSC, through the trilateral groups responsible for science and fish, to initiate research on fish ecology (e.g., population quantity and quality, ecosystem function, closed areas, nursery function for juvenile fish, endangered species, historic species and habitats occurrence, food webs) to support the OUV and sustainable management.

A Grad School for post-graduate students who are setting their first steps in Wadden Sea fish research has been discussed by the EG-S to strengthen trilateral research and educational networks. This would need to be embedded in one of the universities and needs core funding. The Grad School can be seen as complementary to the Wadden Sea World Heritage Summer School educational programme currently being run by CWSS and the Wadden Sea Partnership, and it is envisaged that there would be linkages as far as field work and trilateral activities.

Fish Monitoring in the Wadden Sea

In order to address the goals for "Harmonisation of existing monitoring programmes and research", first essential steps have been completed, such as the collation of metadata (purpose, methods, time and place, parameters, responsibilities, reporting, data availability etc.) and the selection of candidate monitoring parameters for the Trilateral Monitoring and Assessment Programme (TMAP), to feed into the revision of the TMAP and updating of TMAP Monitoring Handbooks (Walker *et al.* 2022a) (see Wadden Sea Swimway microsite). This approach addresses existing monitoring gaps regarding fish, ensuring that input for the Wadden Sea Quality Status Report (QSR) is comprehensive and enables an assessment of the ecological status of the Wadden Sea.

The report recommends the following focused and dedicated investigations to cover the most severe gaps:

For reporting, data availability and exchange we recommend:

- that the data exchange format proposed in Walker et al. (2022a) could be trialled for effectiveness;

- to have links provided to data repositories and to develop and publish R scripts or templates to harmonise and analyse datasets of the different monitoring programmes to facilitate the QSR, plus more in-depth and frequent reporting;
- To identify any national initiatives to improve data availability and to discuss if and how these can be linked to improve data availability at the trilateral level;
- To harmonise pelagic surveys across the three countries;
- Save historical stow net data: The new and old methods should be compared to provide insights into comparability, particularly regarding calibration.

## 7.2 POLICY

### General Approach

Current national and international policies and regulations which are potentially relevant to achieving the Trilateral Fish Targets have been described and analysed with regard to their contribution to the realisation of the Fish Targets (WG-Swimway, 2021). Next steps need to be identified, incorporating recommendations from the policy statement and mid-term review (Kellermann, 2022).

### Future Topics

One recommendation from the Policy Statement is to make better use of the existing legislative frameworks, including the trilateral declarations and the Wadden Sea Plan and the SIMP Integrated Management Plan for One Wadden Sea World Heritage, but also requirements of European legislation such as MSFD, Habitats Directive, Water Framework Directive, EU Restoration Regulation and EU Biodiversity Strategy.

Wadden Sea fish researchers should put more emphasis on science-policy integration in the political areas of the regions. There is a need to improve communication and get the message across to stakeholders involved in key processes and ultimately decision-makers (Kellermann, 2022).

Agree on goals for improved scientific knowledge and its use in management. This may cover better and multiple use of scientific data, indicator and monitoring schemes, decision support tools for e.g., natural resource management. A key role of Swimway could be to provide guidance on best practise to individual scientists (Kellermann, 2022).

## 7.3 MEASURES

### General Approach

At various locations in the Wadden Sea, conservation measures have already been carried out to improve living conditions for, and to mitigate threats to, fish. An integrative and comprehensive overview of such measures, together with a review of their contribution to the realisation of the

Fish Targets, will help to evaluate the dos and don'ts and identify the "lessons learned". Combining this approach with the analysis of the bottlenecks (Pillar Research) will help gain insight into where measures might be developed in a participatory process with stakeholders.

The Swimway programme will continue to assist the trilateral community in sharing data and information between the three countries, defining best practices and applying research outcomes to develop measures and improve fish conservation. The information will be provided clearly and coherently and discussed with stakeholders in close collaboration with the relevant (nature conservation) authorities. Special emphasis will be given to the exchange of best practice examples between the different water, coastal defence and nature authorities and the stakeholders concerned.

#### Future Topics

Create an Atlas of Measures - work in collaboration with the responsible authorities (National Park administrations, Rijkswaterstaat, BfN) on a map showing concrete measures. For example, it has long been known that fish migration routes are influenced by anthropogenic structures and that this impedes the closing of life cycles. Developing refuge and resting areas for fish species, enhancing fish migration through technical obstacles like sluices and pumping stations in the coastal dikes, and the restoration of habitats can collectively help to close fish life cycles and support the requirements of the MSFD, Habitats Directive, Water Framework Directive, EU Restoration Regulation and EU Biodiversity Strategy.

### 7.4 STAKEHOLDER ENGAGEMENT, COMMUNICATION & EDUCATION

#### General Approach

It is important to build an integrated framework to raise awareness and motivate relevant actors, to inspire decision makers and to promote actions. A trilateral education and communication programme on fish conservation to address the fish targets needs to be developed for stakeholder involvement and political support to be integrated into the existing framework.

Progress up until now can be seen in the two international Swimway symposia which have been organised in Hamburg (2019) and Groningen (2024), and on the Wadden Sea Swimway microsite. A third Swimway conference is foreseen for 2027 in Denmark.

#### Future Topics

The strategies described in this Swimway Vision and Action Programme aim at improving life conditions for fish, thereby substantially increasing the probability of successful life cycle completion. Effective implementation of these actions depends on the commitment of all stakeholders. More specific aims are:

- Raise awareness amongst stakeholders: Collate and communicate the existing knowledge about fish using the Wadden Sea and promote the knowledge about the movement of fish species outside the Wadden Sea including inland waters, the North Sea and beyond.
- Engage and mobilise stakeholders: Inspire involved parties to connect trilaterally in sharing knowledge and experiences.
- Foster international partnerships, dialogues and cooperations: Stimulate communication between countries and sectors about fish in the Wadden Sea.
- Develop tools to enhance the communication between the stakeholders with different areas of focus or expertise.
- Perpetuating and optimising the interaction between all stakeholders, including scientists. For each of these aims, it is necessary to have a clear impression of stakeholder involvement and communication strategies and activities that need to be planned. These activities will all be closely connected with actions related to research and monitoring, policy and measures.

### Specific Trilateral Actions

- Build on a series of Swimway webinars and workshops to involve practitioners based on the discussions in the EG-S and the action points in the Swimway Vision and Action Programme.
- Foster international partnerships, dialogues and cooperations: stimulate communication between countries and sectors about fish in the Wadden Sea.
- Coordinate trilaterally on how to involve practitioners and other stakeholders in organising partnerships under the umbrella of the Trilateral Partnership in support of the Wadden Sea World Heritage and develop communication tools and/or a communication strategy within the trilateral communication framework.

## 8. National Initiatives

There are initiatives in each of the three countries to address the fish targets, such as the enhancement of fish passages at sluices and pumping stations for diadromous fish. The EG-S will collate all the available information on man-made bottlenecks and measures for fish into a comprehensive matrix including activities, time frames and persons responsible for each of the specific cases. The EG-S will use this information to identify where measures have been implemented, and to evaluate their effectiveness and will report on progress of this on an annual basis. This will explicitly address the overarching target that *there should be no human-induced bottlenecks in the Wadden Sea for fish populations or their ecosystem functions*.

## 9. Relation to the SIMP Integrated Management Plan for One Wadden Sea World Heritage

The Swimway Vision and Action Programme operationalises the implementation of the trilateral objectives of the SIMP Integrated Management Plan for One Wadden Sea World Heritage while supporting the protection of the Wadden Sea's Outstanding Universal Value and safeguarding the sustainability of uses in the Wadden Sea. With the implementation of the SVAP it will be possible to address the OUV, Key Values and Key Topics by promoting knowledge exchange and collaboration across the three trilateral countries, Swimway directly supports the Integrated Management Plan's objectives of an integrated, transboundary governance in the Wadden Sea.

Swimway connects directly to two of the World Heritage selection criteria and five Key Values:

**Criterion (ix) Ongoing ecological and biological processes**

- Intact intertidal ecosystems
- Linked geomorphological, biophysical and biological processes
- High biomass production typical for the Wadden Sea
- Key site for sustaining abundant wildlife beyond its borders

**Criterion (x) Vital habitats for in-situ biodiversity conservation**

- High typical biodiversity

Within the **Key Topic "Fisheries"** there are linkages to:

- **Activity 5.** The TWSC, through the trilateral groups responsible for science and fish, to initiate research on fish ecology (e.g., population quantity and quality, ecosystem function, closed areas, nursery function for juvenile fish, endangered species, historic species and habitats occurrence, food webs) to support the OUV and sustainable management.
- **Activity 6.** The TWSC to produce a coordinated approach to contribute to reaching the objectives of the EU Biodiversity Strategy for 2030 according to nationally based interpretation of key elements thereof and in line with the Wilhelmshaven Declaration 2022.

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# 11. Action Programme

*Table 2. Legend outlining the cost categories and priority levels applied in the following tables.*

| Costs | Estimated costs | Priority | Key priorities to achieve targets |
|---|---|---|---|
| € | 10,000-25,000 € | * | Low |
| €€ | 25,000-75,000 € | ** | Medium |
| €€€ | > 75,000 € | *** | High |

These are high level actions that still need to be further implemented. To date no funding has been secured for the actions which are detailed below. The suggested budgets in the list of actions are indicative and there is no commitment by parties as yet. This is a list of actions that EG-S has identified as needed to address the trilateral fish targets, both at national level and trilaterally.

## 11.1 OVERARCHING ACTIONS

*Table 3. Overview of overarching actions linked to the pillars and target actions, including implementation years, estimated costs, and assigned priorities.*

| Pillars & Target Actions | When | Cost (see above) | Priority (see above) |
|---|---|---|---|
| **Research & Monitoring**<br>- Develop Wadden Sea Grad School | 2026-2028 | € | ** |
| **Policy**<br>- Identify how the existing frameworks can enable agencies to address the fish targets | 2026-2030 | € | ** |
| **Communication**<br>- Organise annual webinars (e.g. improving connectivity; reducing impact of human activities) | 2026-2032 | € | *** |
| - Fostering engagement of EG-S in international partnerships, dialogues and cooperations by organising exchange of information and strategies | 2026-2032 | € | *** |
| - Develop a stepwise approach toward organising partnerships and developing communication tools and/or a communication strategy | 2026-2027 | € | *** |

## 11.2 ACTIONS RELATED TO TRILATERAL FISH TARGETS

*Table 4. Actions associated with the implementation of the Trilateral Fish Targets, including target descriptions, related measures, timelines, estimated costs and priority levels.*

| Targets | Actions | When | Cost (see above) | Priority (see above) |
|---|---|---|---|---|
| **1. Viable stocks of populations and a natural reproduction of typical Wadden Sea fish species** | Initiate year-round monitoring in the Wadden Sea | 2026-2028 | €€€ | *** |
| | Develop a suite of indicators for the implementation of the fish targets in order to assess if the targets have been met; these will also enable the evaluation of the effectiveness of measures | 2026-2030 | €€ | ** |
| **2. Occurrence and abundance of fish species according to the natural dynamics in (a)biotic conditions** | Harmonise (and expand) monitoring of pelagic fish | 2026-2032 | €€€ | *** |
| | Improve reporting, data availability and exchange. | 2026-2028 | €€ | *** |
| | Identify any national initiatives to improve data availability; discuss if and how these can be linked to improve data availability at the trilateral level. | 2026-2028 | € | ** |
| **3. Favourable living conditions for endangered fish species** | Recognise the Wadden Sea area as a nursery area for tope shark | 2026-2036 | €€ | ** |
| **4. Maintenance of the diversity of natural habitats to provide substratum for spawning and nursery functions for juvenile fish** | Include habitat requirements for juvenile herring, sprat and flatfish in salt marsh management plans | 2026-2028 | € | *** |
| **5. Maintaining and restoring the possibilities for the passage of migrating fish between the Wadden Sea and inland waters** | Aim to have an increased number of migratory bottlenecks addressed in the coming years | 2026-2032 | €€ | *** |
| | Improve and protect suitable habitat for reproduction of smelt in the estuaries | 2026-2030 | €€ | ** |
| | Atlas of measures. Work in collaboration with the responsible authorities (National Park administrations, Rijkswaterstaat) on a list of measures | 2026-2028 | € | *** |