

LOWINFOOD

**Multi-actor design of low-waste food value chains
through the demonstration of innovative solutions
to reduce food loss and waste**

GA No. 101000439

D4.7 Policy brief: food waste prevention and reduction in the fish supply chain

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16/06/2025	Abstract, section 1 and p.3 of policy brief amended	Following remarks of the reviewers, a clearer link between the introduction and the content of the policy brief is added, as well as the type of stakeholders addressed.

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LOWINFOOD Consortium

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4	FH Munster University of Applied Sciences	ISUN	Germany
5	The James Hutton Institute	JHI	United Kingdom
6	Universitaet Fuer Bodenkultur Wien	BOKU	Austria
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11	Matomatic AB	MATO	Sweden
12	Unverschwendet GmbH	UNV	Austria
13	Akademie Deutsches Baeckerhandwerk nord GGmbH	ADB	Germany
14	Foresightee (terminated on 30/01/2023)	FOR	Belgium
15	Leroma GmbH	LER	Germany
16	Mitakus Analytics UG	MITA	Germany
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Summary

Reducing food loss and waste is critical for the sustainability of food value chain and for food security. This deliverable, D4.7 “Policy brief: food waste prevention and reduction in the fish supply chain” builds on lessons learned from the implementation of the dialogue with stakeholders of the seafood value chains in Germany and Scotland in the framework of T4.1 “Supply chain dialogue to identify hotspots of FLW in the fish sector” of LOWIN FOOD WP4 “Innovations to prevent and reduce fish loss and waste”. Based on the findings of an initial literature review (T4.1.1), as well as the stakeholder dialogues proper (interviews with 35 stakeholders of the seafood value chains in Scotland and Germany; engagement during industry events; and an industry-level survey on valorisation of seafood materials disseminated in the case study countries and beyond), we derived a set of policy recommendations for preventing and reducing loss and waste in the seafood value chains of Scotland and Germany, addressed to regional, national and EU policy makers. These recommendations are illustrated in a concise and agile policy brief to be disseminated in PDF format or distributed at the final stakeholder events and other relevant occasions after printing. This document identifies the main flows of waste that emerge in different parts of the seafood supply chain, the barriers to valorising processing by-product and reducing surpluses, potential economic gains from valorisation, and innovation needs of the industry to address these challenges. The document does not only report the findings of the dialogue, but also offers direction for future policy and research to address the identified challenges in the overall seafood value chain, and in Scotland and Germany in particular, and hopefully serves as a tool to bridge the gap between research and policy action.

1. Introduction to the deliverable

LOWINFOOD is a project committed to co-designing, together with food value chain actors, low-waste value chains by supporting the demonstration of a portfolio of innovations in a set of value chains particularly concerned by food loss and waste (fruits & vegetables, bakery products, and fish), as well as in at-home and out-of-home consumption. Each of these value chains corresponds to a single Work Package (WP) of the project. This deliverable builds on WP4 "Innovations to prevent and reduce fish losses and waste".

The LOWINFOOD innovations are selected among promising solutions that have already been developed and tested by some partners of the consortium, with the aim to provide the necessary demonstration, and upscale to allow market replication.

The LOWINFOOD consortium comprises 28 entities, located in 13 different countries, ranging from universities and research institutes to start-ups, foundations, associations, and firms working in the food sector. During the 52 months of the project, the partners are committed to complete 30 tasks and to deliver 60 outputs (deliverables).

A fundamental part of the LOWINFOOD project's dissemination strategy is the development of guidelines, policy briefs, protocols, and training course packages to also benefit non-academic audience. A policy brief based on the seafood supply chain dialogue implemented in Scotland and Germany was developed as part of this dissemination strategy, and aims to communicate findings of the analyses in WP4 to the policy makers at regional, national and EU levels, ensuring that critical issues in the seafood value chains of our case study countries (and beyond) are effectively communicated to be hopefully addressed.

The content of the policy brief is based on the results presented within D4.3 "Report on fish supply chain dialogue" (Koseoglu *et al.*, 2024). These findings have been discussed with the German stakeholders in the framework of the final event "*Thementag Fisch*" / "*A Day For Fish*", organised on 3rd September 2024 in Münster, Germany (Engelmann, 2024), and will be also discussed with the Scottish stakeholders in the framework of the final event "*Addressing waste reduction in the Scottish seafood industry*", which will take place on 1st November 2024 in Aberdeen, Scotland (Mzek *et al.*, 2024). In this way, the research teams of the James Hutton Institute and FH Münster University of Applied Sciences ensured a two-way exchange with the stakeholders, feeding back to them the results of the task in which they have been involved.

The policy relevant messages based on the findings of the stakeholder dialogue and the revalorisation survey are partly common to Scotland and Germany, and partly distinct, due to the specific nature of their seafood value chains. We have identified and recommend five main actions for policy: better quantification and characterisation of by-product flows through primary data collection; development and mainstreaming of standards along the value chain to improve catching, processing, and storage conditions in locations where imports originate from; reform in the policies around waste processing and immigration of skilled workers in the seafood industry; and investments in research to develop, for instance, in technology for by-catch prevention, better real-time prediction of fishing grounds, optimisation of processing through AI and mechanisation, and new higher value end-uses of by-

product materials. Some of these points are universal. For instance, in both countries and elsewhere, recording more and higher quality data is essential for better traceability in increasingly internationalised supply chains, and to develop further business cases for investment into the valorisation of by-products, unwanted catch, and other surplus materials that cannot be eliminated.

Other points are more specific to the case of Scotland and possibly other net exporters of seafood in the Global North; or to the case of Germany and possibly other net importers of seafood in the Global North. For instance, understanding the amount and characteristic of by-products is needed to create additional value from the catch, while addressing (preventing) unwanted catch is essential for reducing seafood companies' operational costs, primarily on the Scottish side where fishing and processing are dominant activities. In Germany, better coordination with suppliers in the Global South, mitigation of the shortage of (skilled) workers, and better nutritional education among consumers will help address various inefficiencies that lead to spoilage at different stages of the value chain, most of which is concentrated around export and consumption related activities on the German side. Overall, the narrowness of consumers' preferences for seafood emerged as a relevant challenge in both countries and possibly in the wider geographical context of the Global North.

2. Policy brief

The EU LOWINFOOD policy brief "Interventions for preventing and reducing loss and waste in the seafood value chain in Scotland and Germany" is provided, in its final form for dissemination, including images, headers and footers, in the following pages of this document (pp.7-14). Best practices detailed in the step-by-step policy brief writing guidelines of the Christian Michelsen Institute (CMI, n.d.) were followed in the preparation of the document.

References

- Christian Michelsen Institute (n.d.). *5 step policy brief writing guide*. Available at: <https://www.cmi.no/file/4295-5-step-policy-brief-writing-guide.pdf> [accessed 28 October 2024].
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EU LOWINFOOD Policy Brief



The James
Hutton
Institute



FH MÜNSTER
University of Applied Sciences



iSuN
Institut für Nachhaltige Ernährung

**Interventions
for preventing and reducing
loss and waste
in the seafood value chain
in Scotland and Germany**



Key Policy Messages

-  Better data is required to understand the volume and characteristics of by-products and unwanted catch to further valorise these biomaterial streams
-  In Scotland, valorisation of by-products would add further value to the catch, and reduction of unwanted catch would reduce seafood companies' operational costs
-  In Germany, improvements could come through better coordination with suppliers from the Global South, mitigation of the shortage of (skilled) workers, and better nutritional education

Summary

*The efficient use of seafood resources is key for achieving sustainable, low-waste food systems. The seafood work package of the EU H2020 LOWINFOOD project ran between November 2021 and November 2024 and focused on the seafood value chains in two European countries, Scotland and Germany. A stakeholder dialogue approach was adopted as a social innovation to improve communication and collaboration along the value chain and between industry and researchers. Numerous stakeholders have been engaged through interviews, focus groups, industry events, and surveys. LEROMA, a business-to-business material exchange platform, was promoted as an innovative solution to match buyers and sellers of surplus and by-products materials. **This brief presents the regional, national and EU policy implications of this research.***

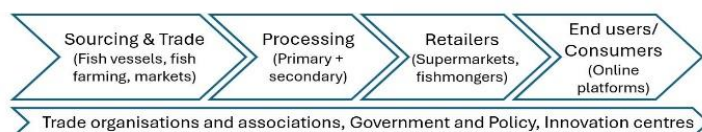
Waste is not perceived to be an appropriate term by industry, as very little or no seafood materials currently get landfilled. The goal is rather to move these products up in the waste pyramid, from lower value uses to higher value ones, increasing profitability.

Lost and wasted materials can be grouped in two economic categories

Seafood materials that exit the value chain for human consumption can be grouped in two main categories. The first category is the **products** at different stages of the value chain **that** are initially intended for human consumption but **become unfit for this purpose** (for instance, expired goods at retail). All the organisations involved in the LOWINFOOD stakeholder dialogue were interested in preventing the loss of these high value materials. The second category is the **by-products generated through processing**, including processing stages that occur offshore (e.g., heads, tails, guts, skins, shells, bones, trimmings, etc.). These materials have little or no current market value, and generating additional income from them is hardly possible given the current prices due to the costs of storage, transport, refrigeration, and labour. In most instances, producers are content to give these materials away free of charge or for a low payment to reduce their disposal costs.

Different structures of the Scottish and German seafood industries led to recruitment of different stakeholder profiles. While the first category of waste that occurs due to value chain inefficiencies is relevant to the consumption-heavy German value chain, the second category linked to the production and processing stages is more relevant to the production-heavy Scottish value chain. In Scotland, the policymakers engaged and consulted can be grouped in two main categories: those who were involved in the dialogue from the start, and those who contributed in different capacities later in the project. The first group included a wide range of stakeholders such as regional and national policymakers, public organisations supporting innovation and knowledge exchange, start-ups, and seafood industry bodies across Scotland and the UK. The second group included Scotland's circular economy public body, a cross-party and cross-sectoral group of seafood industry and political representatives at all levels, a charity working closely with the Scottish Government on food policy and practice, and the fisheries department of a public body supporting regional growth and development. Both groups were represented at the stakeholder dialogue final event, where the results were discussed. In Germany, the stakeholder dialogue focused more on the processing and catering industry. However, policymakers were involved in the dialogue and in the final event in Germany.

Scottish value chain



German value chain



Despite differences in the operations and types of stakeholders recruited in Germany and Scotland, they similarly consider that their type of businesses does not create large quantities of waste, even though current studies suggest that **removal of materials** from the value chain for human consumption **occurs at each stage of the value chain**.

The Scottish and German value chains differ greatly as Scotland is a major exporter of seafood, while Germany is a major importer

The stakeholders in both value chains similarly did not link recent world events such as Brexit, the COVID-19 pandemic, and the war in Ukraine with any long-term or significant food loss and waste creation. However, indirect impacts such as labour shortages, particularly in the processing sector, were suffered in the UK after Brexit, and short-term redirection of international trade flows was observed.

The seafood industry in Scotland is tight-knit, and many of the actors throughout the value chain have existing relationships with or awareness of one another

Also, increased fuel and electricity costs made the efficient use of materials relatively less salient especially for small and medium enterprises, potentially preventing these companies from innovating due to uncertainties and high cost of borrowing.

The stakeholder dialogue has made it obvious, at least on the Scottish side, that industry stakeholders already had **vibrant networks** through organisations like regional producer and fishermen associations, trade federation (e.g., of fishmongers, fish friers, etc.), and seafood industry level organisations operating across trades and across all regions of Scotland (e.g., Seafood Scotland, Seafish Scotland). Therefore, lack of networks within the seafood industry turned out not to be a main driver of loss and waste creation. However, the same cannot be said for **inter-sectorial connections** between seafood industry stakeholders and the **innovative users of by-products**,¹ which are not many in Scotland and in the UK in general. This results in a lost opportunity to add value to by-products.

¹ This is less likely for aquaculture where production and by-products flows are more predictable. Although many of the resulting by-products could likely be processed jointly with the catch sector, this type of production was not the focus of the dialogue.

Unwanted catch due to mismatches between fishing quotas and fish availability at sea was identified by the various type of stakeholders as the main cause of loss and waste. Downstream in the value chains, the key challenges to adding value to by-products and preventing waste are mostly related to **high capital and transactional costs** required for uncertain economic outcome of re-using by-products. This uncertainty is linked with the **lack of demand for by-products** from high-value users, costs associated with transport and energy, and additional labour required for sorting and storing by-products before sale to specialised and high-paying markets. Only companies with large and continuous by-product flows could afford to invest in exploring and developing valorisation opportunities.

The difficulty in monitoring international suppliers and shortage of skilled workers are the main issues leading to loss and waste in the German seafood value chain

In the German value chain, food loss and waste are often due to the lack of (skilled) workers. High levels of **loss occur upstream** (in fisheries and primary processing **in the Global South**), while high **waste occurs at the consumer level**. Some stakeholders in Germany mentioned the role of regulations in reducing food loss and waste, and particularly the need for reform in EU regulations for the reuse of side streams. The regulatory gaps in the usability of side streams were criticised as preventing further processing for human consumption in Germany.

On the other hand, stakeholders expressed a certain **scepticism towards more regulation** or stricter rules, as these could create new and **unintended sources of food loss and waste**. Therefore, when new or amended regulations are introduced, their direct or indirect impact on food loss and waste needs to be considered. The application of government guidelines and recommendations for **uniform reporting** upstream in international value chains were brought up. Indeed, the full enforcement of the EU regulations outside the EU is seen as difficult in a highly internationalised value chain like the German one. **Voluntary labels** were proposed as an alternative option to professionalise primary producers and processors in developing countries where German seafood imports come from to a significant extent, thus reducing post-harvest losses.

The **shortage of workers** has an impact at various points along the German value chain. It can lead to the cold chain being interrupted during loading, handover, transport, or distribution; errors during processing; or goods not being sold in time before their expiration date in retail. Additionally, it can lead to not producing the right quantities and exceeding storage times in catering. All of this leads to food losses and waste in turn. Therefore, the framework conditions along the value chain including working conditions of employees, integration of foreign workers into the job market, and regulations for recruiting foreign workers, should be designed in such a way jobs are perceived as attractive, and the shortage of workers can thus be counteracted.

Consumers' preferences for few species (called “The Big Five” in the UK) and for fresh produce at retail level also creates waste downstream. In both countries **retailers have an important role in shaping consumer demand** and as such, they can help diversify it by making a larger selection of species and cuts available in their stores and/or providing alternatives recipes based on frozen products, leftovers, and less valuable fish parts. In this regard, the **nutritional education** of consumers also matters. Large amounts of food waste are generated in households for various reasons such as confusing best-before and use-by dates or lacking the skills to use all the parts of fish. In addition to campaigns with adult consumers as the target group, nutritional education in kindergartens and schools is critical, and appropriate educational policy measures should be taken here.

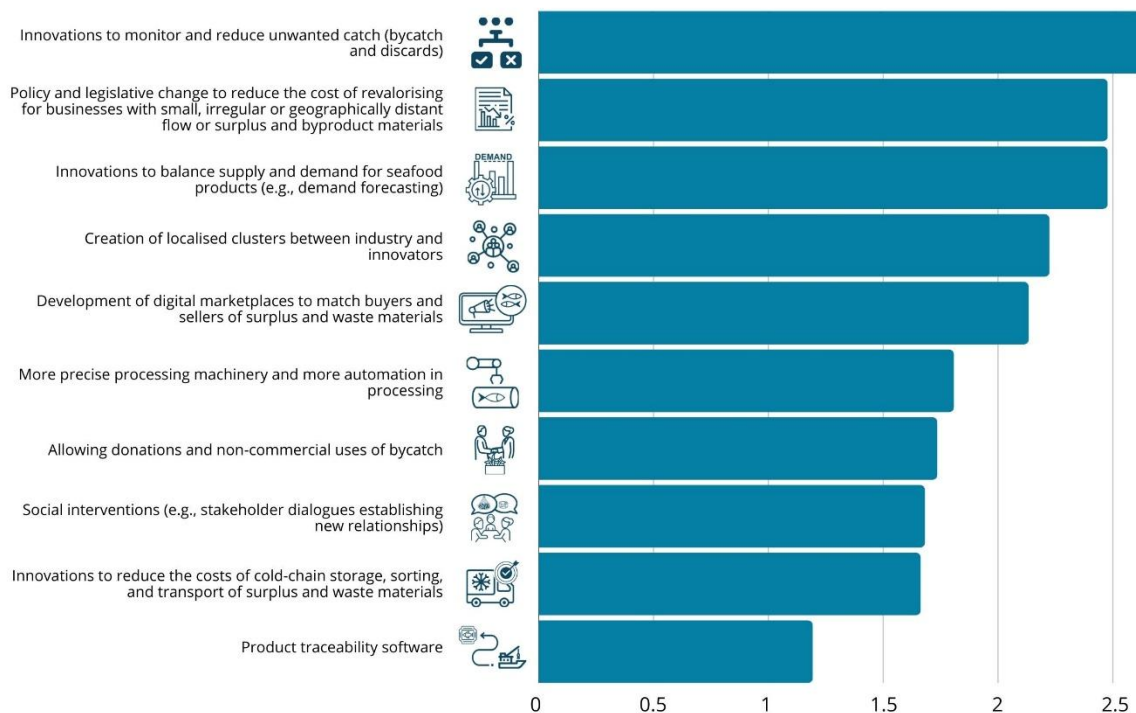
Drawing on the lessons learned during the dialogue, LOWINFOOD researchers developed a short **survey** aimed at the wider industry in Scotland, Germany, and beyond. To obtain a more systematic assessment of the findings of the dialogue, respondents were asked to **select and rank** the most relevant **challenges** and **opportunities**, and the most promising **interventions** to reduce or prevent the loss and waste of seafood resources. The survey was distributed at a range of **industry events** – the Fish International 2024 fair in Bremen, Germany; a meeting of Scotland's North East Fisheries Development Partnership, which is a policy-industry forum for the seafood industry in this region of the country; the Scottish Skipper Expo 2024 in Aberdeen, Scotland; and the Aquaculture and Fisheries Working Group of the EU SUBMARINER network for Blue Growth at their meeting on seafood side-streams valorization. Additionally, a press release was published in relevant local newspapers and industry magazines in both countries.

A survey with value chain stakeholders provided broader insights into barriers, opportunities and challenges

The respondents came from various sectors along the value chain, with **fishing, processing and distribution** accounting for around two thirds of the total. Over 60% came from managerial positions, indicating they have some level of power over and responsibility of the operations of their organisations. More than half of the sample came from the UK, including 42% from Scotland; 14% from Germany; and 33% came from the rest of the world, including EU and other European countries, primarily Norway and Iceland. Their insights are summarised below.

Challenges: According to the Scottish respondents, the largest challenges to creating value from seafood materials are **unwanted catch** and the **high cost of storing, sorting, and transporting surpluses and by-products**, while the standards set by buyers scored lowest. In Germany, where production is not as large as Scotland, the major challenge was identified as the high cost of storing, sorting and transporting surplus material and by-products.

Promising interventions: In Scotland, in parallel to the challenges, the most needed innovations were those against **unwanted catch**, followed by more precise (and automated) **processing machines**; methods to **balance supply and demand** such as demand forecasting software; and **policy and legislative changes** helping SMEs in valorisation. According to German respondents, the most promising interventions were the creation of **localised clusters**, and **digital marketplaces** for matching sellers and buyers. The assessment of the single interventions varied much more among German than among Scottish respondents.



Most promising interventions as ranked by industry²

Opportunities: Scottish and German respondents were well aligned in terms of opportunities, with the **diversification of consumers' preferences** scoring highest for both; whilst improved scientific understanding of fishing grounds scored second in Scotland and third in Germany.

What needs to change to get the most value out of seafood resources?

1. Better quantification and characterisation of by-product flows through primary data collection

Data for much of the current seafood and shellfish side streams and by-products is not collected in the industry. Market competition between different stakeholders, especially processors, might limit the public disclosure of this data. However, uncertainty around annual flow and type of

² The respondents could select and rank up to five interventions, with 5 being the highest rank. To generate the final graph, a value of 0 was assigned to unselected interventions.

material available for reuse or recovery limits the investments required to add further value in Scotland and elsewhere. This gap could be addressed via data collection at enterprise level disclosed anonymously to independent sectorial bodies, as well as indirect statistical estimates.

2. Developing and mainstreaming standards along the value chain to improve catching, processing and storage conditions in locations where imports originate from

In international value chains, each country would have different norms related to key aspects such as catching and landing fish, processing, sustainability, and waste management. In these settings it would not be possible to enforce one country's or one jurisdiction's law over others. Also, more and stricter regulation does not always mean less loss and waste, and can have unintended outcomes. Voluntary certification programmes and labels such as that of the Marine Stewardship Council or the Naturland Wild Fish standard in Germany become critical for monitoring suppliers overseas and assuring sustainable resource management across the value chain.

3. Reforming the policy around waste processing and immigration of skilled workers in the seafood industry

While policy is not always the answer, it is critical in other aspects, such as alignment of organic waste regulations between neighbouring countries (e.g., England and Scotland) to facilitate the transfer of by-products, or in term of immigration to address skilled labour shortages in the seafood industry that lead to waste creation or reduced valorisation of by-products.

4. Reducing geographical distance and taking the weight of transactional costs off the shoulders of individual (small) players through cost and facility sharing, and matchmaking between buyers and sellers via local clusters and international platforms

There is a recognition of this need in Scotland, and a lot of progress and investments have been made in the last few years. The most concrete example is the Seafood Centre of Excellence of the Scottish White Fish Producers Association in Fraserburgh in North East Scotland, which will be completed by the end of 2024. The centre will address common concerns such as safety and skill training for local and international labour, education and business development, resource efficiency, innovation, and sustainability, and will provide facilities for the local fishing industry. Such centres and innovation clusters are key to include SMEs in valorisation and wider innovation efforts.

5. Investing in research to develop, for instance, technology for by-catch prevention, better real-time prediction of fishing grounds, optimisation of processing through AI and mechanisation, and new higher value end-uses of by-product materials

The success of the Ocean Cluster concept, first developed in Iceland, has led to the foundation of sister clusters worldwide, bringing innovators and seafood value chain stakeholders together to achieve higher yield and value out of seafood materials. There are also private and non-governmental organisations and public-private partnership projects focusing on innovation in specific parts of the seafood industry, i.e., the processing sector, that provides opportunities for knowledge exchange and collaborations at local and international levels. Such initiatives that consider the

needs and structure of local industries and address their innovation and collaboration needs are the way forward.

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Additional resources



LOWINFOOD
Fish value chain



**The James Hutton
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