Foresight Study on Fishers of the Future

Final Report

European Maritime, Aquaculture and Fisheries Fund (EMFAF)

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December 2024

EUROPEAN COMMISSION

European Climate, Infrastructure and Environment Executive Agency
Unit D3 — Sustainable Blue Economy

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SPECIFIC CONTRACT N°02- CINEA/EMFAF/2023/3.5.1/Lot1/02/SC02/SI2.904011

Implementing Inter-institutional Multiple Framework Contract for supporting better regulation-related activities, with reopening of competition CINEA/2021/OP/0011– Lot 1- Sustainable fisheries and aquaculture, excluding sustainable fisheries partnership agreements (SFPAs)

This report should be cited as:

Davies, M., Macfadyen, G., Brugere, C., Chiarelli, N., Dale, F., and Caillart, B., *Foresight Study on Fishers of the Future*, Publications Office of the European Union, 202X, doi: 10.2926/3984926

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Manuscript completed in January 2025

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Luxembourg: Publications Office of the European Union, 2025

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PDF ISBN 978-92-9405-159-2 doi: 10.2926/3984926

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Acronyms

AC	Advisory Council
AI	Artificial Intelligence
CFP	Common Fisheries Policy
CINEA	European Climate, Infrastructure and Environment Executive Agency
CWP	Coordinating Working Party on Fishery Statistics
DG MARE	Directorate-general for Maritime Affairs and Fisheries
EMFAF	European Maritime, Aquaculture and Fisheries Fund
EMS	Electronic Monitoring Systems
ERS	Electronic Reporting Systems
ETP	Endangered, Threatened and Protected
EU	European Union
FAO	Food and Agriculture Organisation
FGDs	Focus Group Discussions
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel on Climate Change
IT	Information Technology
IUU	Illegal, unreported, and unregulated
JRC	Joint Research Centre
KIIs	Key Informant Interviews
LSF	Large-scale fisher(ies)
MPA	Marine Protected Areas
NGO	Non-governmental Organisation
PESTLE	Political, Economic, Social, Technological, Legal and Environmental

PO	Producer Organisation
RFMO	Regional Fisheries Management Organisation
SP	Social Partner
SSF	Small-scale fisher(ies)
STECF	Scientific Technical and Economic Committee for Fisheries
UK	United Kingdom

Executive summary

Commissioned by the European Climate, Infrastructure, and Environment Executive Agency (CINEA) and the Directorate-General for Maritime Affairs and Fisheries (DG MARE), this strategic foresight study explores the future of fishers in the European Union (EU) up to 2050. The study was conducted by Tetra Tech International Development, in collaboration with Poseidon Aquatic Resource Management Europe, Ipsos, F&S, Trinomics, and supported by additional expertise and a network of country experts covering 22 coastal Member States and outermost regions.

The study represents the Commission's commitment, outlined in its 2023 Communication on the functioning of the Common Fisheries Policy (CFP), to address emerging challenges in the sector. It aligns with the Commission's definition of foresight as "the discipline of exploring, anticipating, and shaping the future to inform today's decision-making." This participatory study places fishers at its core, integrating their perspectives into the development of future scenarios and fisher profiles to inform strategic policymaking for a sustainable, competitive and resilient EU fishing sector, as part of the wider blue economy. It does not present policy proposals, which was never the intention, rather it serves to stimulate further the important debate on securing and giving a perspective on the future of EU fishers.

Context and rationale

As one of the pillars of coastal communities and economies, EU fisheries play a vital role in providing a healthy supply of food to local, national and international markets. They are also part and parcel of the EU's coastal cultural heritage. However, the sector faces increasing pressures from climate change, biodiversity loss, economic uncertainties, and geopolitical challenges. These realities underline the need for a forward-looking approach to ensure the long-term future of fisheries.

This study is a foresight exercise to project the strengths, weaknesses and opportunities the sector may face in the future. It anticipates transformations in fishers' roles and identity and examines trends influencing fisheries, including environmental and technological drivers, demographic shifts, and market trends. It also considers fishers' broader contributions to marine conservation, coastal development, and maritime spatial planning. By envisioning different possible futures, the study provides a foundation for informed decision-making, ensuring fishers remain integral to the EU's sustainable blue economy.

Methodology

The study employed a participatory and people-centred approach, in keeping with foresight practice, in order to benefit from and harvest collective intelligence and

experiences. Using mixed methods (including interviews, focus groups, an adapted photovoice exercise, and a series of workshops), the study ensured extensive and close interaction with fishers, policymakers, Advisory Councils ([1]), social partners ([2]), producer organisations ([3]) and other stakeholders at EU and local levels to develop a shared understanding of the challenges and possible future pathways for the sector. The active involvement of fishers and stakeholders was central to the study and contributed significantly to shaping its findings.

The methodology comprised three phases:

- Phase 1 'Setting the Scene' which provided a working definition of a 'fisher', defined the current state of EU fisheries, examined who today's fishers are, and identified key drivers of change through literature reviews, fisher consultations in 22 EU coastal countries and outermost regions, and stakeholder engagement. The outputs of this phase were subjected to validation and input by fisheries stakeholders during a hybrid kick-off event held in Brussels in March 2024.

- Phase 2 'Exploring Future Worlds' which, building on insights from Phase 1, developed four future scenarios for the EU fishing sector with a 2050-time horizon. A 2x2 matrix was constructed using two main drivers (or key axes) which, via the consultative process, were: the state of the planetary crisis and the demand for EU-caught fish. Secondary drivers, such as technological advances, demographic trends, governance and geopolitical challenges, were also identified and used in the consideration of the four different scenarios.

- Phase 3 'Developing Future Fisher Profiles' which provided detailed future profiles of small-scale and large-scale fishers to illustrate each scenario, exploring fishers' characteristics, as well as the changes and adaptations they might go through up to 2050. Example personas to illustrate further each profile are also given. Extensive feedback from fishers, Advisory Councils, social partners and other stakeholders informed the finalisation

([1]) Advisory Councils bring together representatives of industry as well as other interest groups such as environmental NGOs and consumers' organisations. Under the CFP they have a right of consultation when Member States cooperate at regional level to decide the rules which should apply to fishermen in that region. They also provide advice to the Commission and to Member States on fisheries management in their area or sea basin.

([2]) Social partners officially recognised by the European Union. For further information, see Cross-industry and sectoral social dialogue - European Commission and Sea fisheries - Sectoral social dialogue - European Commission.

([3]) Producer organisations are bodies officially recognised by the European Commission, set up by fishery or aquaculture producers, to manage the activity of their members.

of these profiles, which illustrate the diverse realities fishers may face by 2050.

Future scenarios and fisher profiles up to 2050

The four scenarios thus provided a framework for imagining divergent, possible futures, shaped by complex interactions among environmental, economic, geopolitical and social factors, and in turn informed the development of the associated fisher profiles. These are now briefly summarised, starting, for each scenario, with an illustration of the possible world it represents and then profiles for a small-scale and large-scale fisher.

Scenario 1 'Thriving Responsibly'

By 2050, the world has limited global temperature rise, to a moderate increase ([4]) above pre-industrial levels. The EU has met its emission reduction targets and contributed to curbing biodiversity loss, including through improved implementation of the CFP for the exploitation of fish stocks and other environmental policies. The EU has also invested heavily in marine research and adaptive management strategies to mitigate the impacts of changing water temperatures and species distributions. Other EU policies have helped manage pollution of waters. As a result, fish stocks are stable. Significant investments have helped EU fishers integrate advanced technologies into their fleets, supporting their transition to carbon neutrality, traceability and ability to meet the demand for EU caught fish at a reasonable cost. Continuous consumer demand for fish has comforted existing regulatory measures focused on eco-friendly practices, supported by labelling and certification schemes. The EU continues to be a strong advocate for food safety and sustainability at an international level, along with a growing number of third countries.

- **Small-scale fishers** benefit from modernised, energy-efficient vessels and innovative gear. Fishing is generally their main economic activity. Automation and digital tools contribute to efficiency and safety, while direct consumer engagement ensures market viability for their high-value, sustainable seafood. Fishers maintain traditional practices while embracing advanced technologies, ensuring resilience and profitability. They are also a partner of choice in (local) fisheries management. The number of small-scale fishers is however slightly down compared to 2025, there is a digital and education divide amongst fishers, and competition for maritime space and rising costs of vessel modernisation challenge their operations.

([4]) In these scenarios, climate change severity levels are defined in accordance with the Intergovernmental Panel on Climate Change (IPCC) report. 'Moderate' climate change refers to a global mean temperature increase of approximately 2°C above pre-industrial levels, while 'very severe' climate change denotes an increase of 3°C or more.

- **Large-scale fishers** contribute to the restoration of fish stocks, marine ecosystems and food security, thanks to large-scale fleets equipped with cutting-edge technology and engaged in sustainable practices. Advanced AI systems enhance stock management and marketing, while partnerships with scientific bodies bolster governance. Investments in green technologies, though costly, position these fleets competitively in global markets. However, the number of large-scale fishers is down following a consolidation of the fleets and concentration of ownership.

Scenario 2 'Chasing Declining Stocks'

In 2050, fishers and consumers face significant challenges as global temperatures very severely exceed pre-industrial levels, exacerbating climate impacts on ocean and coastal ecosystems. Marine heatwaves and exceptional climatic events have intensified, leading to coastal erosion, sea level rise, habitat loss, and changes in water chemistry and catch composition. This has required the EU to further reduce quotas and other fishing opportunities, resulting in increased conflicts between Member States and with neighbouring countries over scarce resources. The decrease in available fish is significant but the market demand for EU-caught fish is still high, for those who can afford it, as EU products still provide more guarantees of quality and sustainability than non-EU products. Elevated prices for quality and sustainably- sourced fish have segmented the market, pushing price-sensitive consumers towards alternative proteins or non-EU products, regardless of food safety or sustainability.

- **Small-scale fishers** struggle with reduced quotas and rising costs, leading many to leave the sector. Those remaining have adopted new fishing gear or diversified into blue economy activities, or largely rely on niche markets. While high-value products sustain profitability for some, the mental and physical toll of harsh working conditions intensifies. Reliance on public funding and innovative business models and marketing methods becomes critical for survival.

- **Large-scale fishers** can adapt to resource constraints with automation and improved fishing software, but sustainability challenges persist. Larger fleets dominate, leveraging economies of scale to remain viable; however, geopolitical tensions and shifting stock distributions heighten operational uncertainties. Working conditions onboard have improved with increased safety and automated fishing technologies; however, access to financial support is difficult, and technology upgrades are challenging to make.

Scenario 3 'Contested Markets'

By 2050, the world has limited global temperature rise to a moderate increase above pre-industrial levels. The EU has met its emission reduction targets and contributed to curbing biodiversity loss including through improved implementation of the CFP for the exploitation of fish stocks. However, reduced consumer purchasing power has shifted preferences towards cheaper imports and alternative proteins, drastically reducing demand for sustainable EU-caught fish. This has created fierce competition, pushing EU fishers to innovate and specialise in niche markets. Despite increased public funding and technological advancements, the fishing industry struggles with market competitiveness.

- **Small-scale fishers** adapt by specialising in niche, sustainable products. They often rely on direct sales to high-end markets and collaborate with restaurants and local buyers although marketing organisations remain important. While technology aids efficiency, limited demand and high costs challenge viability, pushing many out of the industry. Access to private and public financial support is challenging. Cultural heritage and coastal community ties play a pivotal role in sustaining a sense of purpose and operations.

- **Large-scale fishers** are part of consolidated fleets which focus on efficiency, sustainability, and traceability. Advanced technologies streamline operations and improve competitiveness. However, market pressures and regulatory complexities strain profitability. Selling fish is challenging and large-scale fishers must rely on strategic partnerships with buyers. Investments in green technologies yield mixed results, with some fleets thriving while others exit the sector.

Scenario 4 'Scarcity and Survival'

In 2050, the EU fishing industry faces a perfect storm of challenges. Climate change drastically alters marine ecosystems, making fish stocks unpredictable and harder to manage. This has required the EU to further reduce quotas and other fishing opportunities, forcing the processing industry to rely more on cheap imports, which are also facing reductions owing to the climate catastrophe worldwide and their need to prioritise their domestic markets. Consumers concerned about sustainability who cannot afford to pay a premium for sustainably caught EU fish, are turning towards alternative protein sources, further reducing demand for EU-caught fish. These pressures disproportionately impact small-scale fishers who lack the resources to adapt or compete with large-scale operations and cheaper imports. While some fishing communities are diversifying into tourism or other sectors, many face an uncertain future characterised by socio-economic hardship and cultural change.

- **Small-scale fishers** face dire working conditions, with many abandoning fishing. Fishing practices and landings are drastically different (in terms of species and grounds) and keeping up technological improvements is very challenging. Those remaining operate in cooperative models, often targeting invasive or niche species. Diversification into non-fishing activities, such as conservation or coastal tourism, provides supplementary income for some. Despite resilience, economic instability erodes fishers' confidence.
- **Large-scale fishers'** profitability is marginal, and market competition is fierce. Large-scale fleets contract sharply, with remaining vessels often owned by large corporations. Investments in non-food uses, such as pharmaceuticals or cosmetics, offer limited relief. Recruitment challenges have aggravated, resulting in an increasingly ageing workforce. The future of large-scale fishing, and the large-scale fisher under this scenario, appears uncertain.

Conclusions and recommendations

The four scenarios and associated fisher profiles offer a broad exploration of potential futures for EU fisheries. Each scenario is still possible at the time of writing this report, although some would involve significant policy adaptations or geopolitical shifts. The scenarios highlight the sector's vulnerabilities and opportunities, providing valuable insights for policymakers and stakeholders. In this sense, they serve as tools to anticipate challenges, design targeted policies, and support the sector's structured adaptation to current and expected challenges. Further analysis of the scenarios and profiles by fleet segment and sea basin could refine these tools and provide more tailored insight into specific regional or fleet dynamics. This could be part of the next steps in the discussion to follow on the future of EU fishers, including the definition of a vision for fisheries by 2040.

Whatever the future will be, the scenarios and fisher profiles aim to inform further the debate, investment, innovation, and actions that the fishing industry will need if it is to thrive into the middle of the century and beyond.

Across all scenarios and profiles, some key policy topics considered worthy of further consideration emerge:

- **Promoting planetary resilience**: Investing in adaptive management and marine research to mitigate environmental uncertainties and safeguard fish stocks.

- **Supporting technological and digital transition**: Providing funding and training to ensure equitable access to green technologies and digital skills fostering innovation across fleets.

- **Enhancing market competitiveness**: Strengthening trade policies, supporting local markets, and promoting traceability to differentiate EU products in global markets.
- **Encouraging workforce renewal**: Addressing recruitment challenges through improved working conditions, gender inclusivity, and targeted financial incentives.
- **Fostering diversification**: Enabling fishers to engage in aquaculture, conservation, and other blue economy activities, reducing exclusive reliance on traditional fisheries.

Strategic actions and decisions today can guide the sector towards resilience, sustainability and competitiveness, ensuring that fishers continue to play a pivotal role in Europe's coastal communities. This study, acting as a milestone towards such a vision, invites policymakers and stakeholders to consider these futures as a foundation for informed decision-making and collaborative engagement.

Résumé exécutif

Commandée par l'Agence exécutive européenne pour le climat, les infrastructures et l'environnement (CINEA) et la Direction générale des affaires maritimes et de la pêche (DG MARE), cette étude prospective stratégique explore l'avenir des pêcheurs dans l'Union européenne (UE) à l'horizon 2050. L'étude a été réalisée par *Tetra Tech International Development*, en collaboration avec *Poseidon Aquatic Resource Management Europe*, *Ipsos*, *F&S, Trinomics*, Dr Cécile Brugère, et un réseau d'experts nationaux couvrant les 22 États membres côtiers et les régions ultrapériphériques.

L'étude reflète l'engagement de la Commission, énoncé dans sa communication de 2023 sur le fonctionnement de la politique commune de la pêche (PCP), de répondre aux défis émergents du secteur. Elle s'aligne sur la définition de la prospective par la Commission à savoir « la discipline qui consiste à explorer, anticiper et façonner l'avenir afin d'éclairer les décisions actuelles ». Cette étude participative place les pêcheurs au cœur de ses réflexions, en intégrant leurs points de vue dans l'élaboration de scénarios pour le futur et de profils de pêcheurs afin d'éclairer la formulation de politiques stratégiques pour un secteur européen de la pêche durable, compétitif et résilient, dans le cadre d'une économie bleue au sens large. L'étude ne contient pas de propositions politiques, ce qui n'a jamais été son but, mais tend plutôt à encourager le débat essentiel sur la sécurisation et la mise en perspective de l'avenir des pêcheurs dans l'UE.

Contexte et justification

En tant que pilier des communautés et économies côtières, le secteur de la pêche dans l'UE joue un rôle essentiel dans l'approvisionnement en nourriture saine des marchés locaux, nationaux et internationaux. Il fait également partie intégrante du patrimoine culturel côtier de l'UE. Cependant, le secteur est confronté à des pressions croissantes liées au changement climatique, à la diminution de la biodiversité, aux incertitudes économiques et aux défis géopolitiques. Ces réalités soulignent la nécessité d'adopter une approche prospective pour assurer l'avenir à long terme des pêcheries.

L'étude anticipe les transformations des rôles et de l'identité des pêcheurs et examine les tendances qui influencent la pêche, notamment les facteurs environnementaux et technologiques, les évolutions démographiques et les tendances des marchés. Elle examine également les contributions plus globales des pêcheurs à la conservation du milieu marin, au développement côtier et à l'aménagement de l'espace maritime. En envisageant différents avenirs possibles, l'étude offre une base pour éclairer les décisions, garantissant que les pêcheurs demeurent un élément central de l'économie bleue durable de l'UE.

Méthodologie

L'étude a adopté une approche participative et centrée sur les personnes, conformément à la pratique de la prospective, afin de bénéficier de l'intelligence collective et des expériences. A l'aide de méthodes mixtes (entretiens, groupes de discussion, exercices adaptés de Photovoix et séries d'ateliers), l'étude a garanti une interaction étroite et approfondie avec les pêcheurs, les décideurs politiques, les conseils consultatifs[5], les partenaires sociaux[6], les organisations de producteurs[7] et d'autres parties prenantes aux niveaux européen et local, afin de développer une compréhension commune des défis et des voies possibles pour l'avenir du secteur. L'implication active des pêcheurs et des parties prenantes a été au cœur de l'étude et a contribué de manière significative à façonner ses conclusions.

La méthodologie comprenait trois phases :

- La phase 1 de « Mise en situation » a fourni une définition fonctionnelle du « pêcheur », a défini l'état actuel des pêcheries de l'UE, a examiné qui sont les pêcheurs d'aujourd'hui et a identifié les principaux moteurs de changement par le biais d'analyses documentaires, de consultations de pêcheurs dans 22 pays côtiers et régions ultrapériphériques de l'UE, et de l'engagement des parties prenantes. Les résultats de cette phase ont été soumis à validation et contributions lors d'un événement de lancement organisé en mode hybride à Bruxelles en mars 2024.

- La phase 2 « Exploration de futurs possibles », qui, en s'appuyant sur les résultats de la phase 1, a développé quatre scénarios pour le secteur de la pêche de l'UE à l'horizon 2050. Une matrice 2x2 a été construite en utilisant deux facteurs principaux (ou axes clés) qui, selon le processus consultatif, étaient : l'état de la crise planétaire et la demande en poissons originaires de l'UE. Des facteurs secondaires, tels que les avancées technologiques, les tendances démographiques, la gouvernance et les

(5) Les conseils consultatifs rassemblent des représentants de l'industrie ainsi que d'autres groupes d'intérêt tels que les ONG environnementales et les organisations de consommateurs. Dans le cadre de la PCP, ils disposent d'un droit de consultation lorsque les États membres coopèrent au niveau régional pour décider des règles à appliquer aux pêcheurs de cette région. Ils conseillent également la Commission et les États membres sur la gestion de la pêche dans leur zone ou bassin maritime

(6) Les partenaires sociaux officiellement reconnus par l'Union européenne. Pour plus d'informations, voir *Cross-industry and sectoral social dialogue - European Commission and Sea fisheries - Sectoral social dialogue - European Commission*.

(7) Les organisations de producteurs sont des organismes officiellement reconnus par la Commission européenne, créés par des producteurs de pêche ou d'aquaculture pour gérer les activités de leurs membres.

défis géopolitiques, ont également été identifiés et pris en compte dans l'élaboration des quatre scénarios.

- La phase 3 « Élaboration des profils des futurs pêcheurs », qui a fourni des profils détaillés de pêcheurs à petite et à grande échelle pour illustrer chaque scénario, explorant leurs caractéristiques ainsi que les changements et adaptations qu'ils pourraient subir à l'horizon 2050. Des exemples de personnes sont également présentés pour illustrer chaque profil. Les nombreux retours des pêcheurs, des conseils consultatifs, des partenaires sociaux et d'autres parties prenantes ont permis la finalisation de ces profils, qui illustrent les diverses réalités auxquelles les pêcheurs pourraient devoir faire face d'ici 2050.

Scénarios futurs et profils de pêcheurs à l'horizon 2050

Les quatre scénarios ont fourni un cadre pour imaginer des futurs divergents, façonnés par des interactions complexes entre des facteurs environnementaux, économiques, géopolitiques et sociaux, et ont guidé le développement des profils de pêcheurs associés. Ceux-ci sont brièvement résumés ci-dessous, chaque scénario étant introduit par une illustration du monde possible qu'il représente, suivi des profils pour un pêcheur à petite et à grande échelle.

Scénario 1 : « Prospérer de manière responsable »

En 2050, le monde a limité l'augmentation de la température mondiale à une hausse modérée[8] par rapport aux niveaux préindustriels. L'UE a atteint ses objectifs de réduction des émissions de gaz à effet de serre et contribué à freiner la perte de biodiversité, notamment grâce à une meilleure mise en œuvre de la PCP pour l'exploitation des stocks de halieutiques et d'autres politiques environnementales. L'UE a également investi massivement dans la recherche marine et des stratégies de gestion adaptative pour atténuer les impacts des variations de température des océans et de la répartition des espèces. D'autres politiques de l'UE ont permis de mieux gérer la pollution des eaux. En conséquence, les stocks de poissons sont stables. Des investissements significatifs ont aidé les pêcheurs de l'UE à intégrer des technologies de pointe dans leurs flottes, soutenant leur transition vers la neutralité carbone, la traçabilité et leur capacité à répondre à la demande de poissons pêchés dans l'UE à un coût raisonnable. Une demande continue en poisson des consommateurs a conforté les mesures réglementaires existantes axées sur des pratiques écologiques, soutenues par des systèmes d'étiquetage et de certification. L'UE

([8]) Dans ces scénarios, les niveaux de gravité du changement climatique sont définis conformément au rapport du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC). Un changement climatique « modéré » correspond à une augmentation de la température moyenne mondiale d'environ 2°C par rapport aux niveaux préindustriels, tandis qu'un changement climatique « très grave » correspond à une augmentation de 3°C ou plus.

continue d'être un fervent défenseur de la sécurité alimentaire et de la durabilité à l'échelle internationale, aux côtés d'un nombre croissant de pays tiers.

- **Les pêcheurs à petite échelle** bénéficient de navires modernisés, économes en énergie, et d'équipements innovants. La pêche est généralement leur principale activité économique. L'automatisation et les outils numériques contribuent à l'efficacité et à la sécurité, tandis que l'engagement direct des consommateurs assure la viabilité du marché pour leurs produits de la mer durables et de haute valeur. Les pêcheurs maintiennent des pratiques traditionnelles tout en adoptant des technologies avancées, garantissant résilience et rentabilité. Ils sont également des partenaires de choix dans la gestion des pêches (locales). Le nombre de pêcheurs à petite échelle est cependant légèrement en baisse par rapport à 2025, un fossé numérique et éducatif persiste parmi eux, et la concurrence pour l'espace maritime ainsi que la hausse des coûts de modernisation des navires compliquent leurs opérations.

- **Les pêcheurs à grande échelle** contribuent à la restauration des stocks de poissons, des écosystèmes marins et à la sécurité alimentaire, grâce à des flottes hauturières équipées de technologies de pointe et engagées dans des pratiques durables. Les systèmes avancés d'intelligence artificielle améliorent la gestion des stocks et la mise en marché, tandis que les partenariats avec les organismes scientifiques renforcent la gouvernance. Les investissements dans les technologies vertes, bien que coûteux, positionnent ces flottes de manière compétitive sur les marchés mondiaux. Cependant, le nombre de pêcheurs à grande échelle diminue suite à une consolidation des flottes et une concentration de la propriété.

Scénario 2 : « Courir après des stocks en déclin »

En 2050, les pêcheurs et les consommateurs font face à des défis significatifs car les températures globales dépassent très largement les niveaux préindustriels, exacerbant les impacts climatiques sur les écosystèmes océaniques et côtiers. Les vagues de chaleur marine et les événements climatiques exceptionnels se sont intensifiés, entraînant une érosion côtière, une élévation du niveau de la mer, une perte d'habitats et des changements dans la composition des prises. Cela a obligé l'UE à réduire davantage les quotas et les autres opportunités de pêche, ce qui a accru les conflits entre les États membres et avec les pays voisins pour les ressources rares. La diminution des poissons disponibles est significative mais la demande de poissons pêchés dans l'UE reste élevée, pour ceux qui peuvent se le permettre, car les produits de l'UE offrent davantage de garanties de qualité et de durabilité que les produits non européens. Les prix élevés pour des poissons de qualité et d'origine durable ont segmenté le marché, poussant les consommateurs sensibles aux prix vers des protéines alternatives ou des produits non européens, sans considérations pour la sécurité alimentaire ou la durabilité.

- **Les pêcheurs à petite échelle** luttent avec des quotas réduits et des coûts croissants, conduisant beaucoup d'entre eux à quitter le secteur. Ceux qui restent ont adopté de nouveaux équipements de pêche, se sont diversifiés dans des activités de l'économie bleue, ou dépendent largement de marchés de niche. Bien que les produits de grande valeur soutiennent la rentabilité de certains, le poids mental et physique des conditions de travail difficiles s'intensifie. La dépendance au financement public et à des modèles économiques et méthodes de mise en marché innovantes devient critique pour la survie.

- **Les pêcheurs à grande échelle** peuvent s'adapter aux contraintes de ressources grâce à l'automatisation et à des logiciels de pêche améliorés, mais les défis de durabilité persistent. Les grands navires dominent, tirant parti des économies d'échelle pour rester viables ; cependant, les tensions géopolitiques et les distributions changeantes des stocks augmentent les incertitudes opérationnelles. Les conditions de travail à bord se sont améliorées avec une sécurité accrue et des technologies de pêche automatisées ; cependant, l'accès au soutien financier est difficile, et les mises à niveau technologiques sont compliquées à réaliser.

Scénario 3 : « Marchés contestés »

D'ici 2050, le monde a limité l'augmentation de la température mondiale à une hausse modérée par rapport aux niveaux préindustriels. L'UE a atteint ses objectifs de réduction des émissions et a contribué à freiner la perte de biodiversité, notamment grâce à une meilleure mise en œuvre de la PCP pour l'exploitation des stocks de poissons. Cependant, la réduction du pouvoir d'achat des consommateurs a modifié les préférences en faveur d'importations moins chères et de protéines alternatives, réduisant drastiquement la demande de poissons durables pêchés dans l'UE. Cela a créé une concurrence féroce, poussant les pêcheurs européens à innover et à se spécialiser dans des marchés de niche. Malgré un financement public accru et des avancées technologiques, l'industrie de la pêche peine à rester compétitive sur le marché.

- **Les pêcheurs à petite échelle** s'adaptent en se spécialisant dans des produits durables de niche. Ils comptent souvent sur des ventes directes vers des marchés haut de gamme et collaborent avec des restaurants et des acheteurs locaux, bien que les organisations de mise en marché restent importantes. Bien que la technologie aide à améliorer l'efficacité, la demande limitée et les coûts élevés mettent en péril la viabilité, poussant de nombreux pêcheurs à quitter le secteur. L'accès au soutien financier privé et public est difficile. Le patrimoine culturel et les liens avec les communautés côtières jouent un rôle essentiel dans le maintien d'un sens pour l'objectif et les opérations.

- **Les pêcheurs à grande échelle** font partie de flottes consolidées qui se concentrent sur l'efficacité, la durabilité et la traçabilité. Des technologies

avancées rationalisent les opérations et améliorent la compétitivité. Cependant, les pressions du marché et la complexité réglementaire mettent à mal la rentabilité. Vendre du poisson est un défi et les pêcheurs à grande échelle doivent compter sur des partenariats stratégiques avec des acheteurs. Les investissements dans les technologies vertes donnent des résultats mitigés, certains navires prospérent tandis que d'autres quittent le secteur.

Scénario 4 : « Pénurie et survie »

En 2050, l'industrie de la pêche de l'UE fait face à une tempête parfaite de défis. Le changement climatique modifie radicalement les écosystèmes marins, rendant les stocks de poissons imprévisibles et plus difficiles à gérer. Cela a contraint l'UE à réduire encore les quotas et d'autres opportunités de pêche, forçant l'industrie de transformation à s'appuyer davantage sur des importations bon marché, qui subissent également des réductions en raison de la catastrophe climatique mondiale et de leur besoin de prioriser leurs marchés domestiques. Les consommateurs soucieux de durabilité qui ne peuvent pas se permettre de payer un prix premium pour du poisson pêché durablement dans l'UE se tournent vers des sources de protéines alternatives, réduisant encore la demande de poissons pêchés dans l'UE. Ces pressions impactent de manière disproportionnée les pêcheurs à petite échelle qui manquent des ressources pour s'adapter ou rivaliser avec les grandes opérations et les importations moins chères. Bien que certaines communautés de pêcheurs se diversifient dans le tourisme ou d'autres secteurs, beaucoup font face à un avenir incertain caractérisé par des difficultés socio-économiques et un changement culturel.

- **Les pêcheurs à petite** échelle font face à des conditions de travail désastreuses, beaucoup abandonnant la pêche. Les pratiques de pêche et les débarquements sont radicalement différents (en termes d'espèces et de zones de pêche) et suivre les améliorations technologiques est très difficile. Ceux qui restent opèrent dans des modèles coopératifs, ciblant souvent des espèces envahissantes ou de niche. La diversification dans des activités non liées à la pêche, telles que la conservation du milieu ou le tourisme côtier, fournit un revenu complémentaire pour certains. Malgré leur résilience, l'instabilité économique érode la confiance des pêcheurs.

- La rentabilité des **pêcheurs à grande échelle** est marginale, et la concurrence sur le marché est féroce. Les flottes hauturières se contractent fortement, les navires restants étant souvent détenus par de grandes entreprises. Les investissements dans des utilisations non alimentaires, telles que les produits pharmaceutiques ou cosmétiques, offrent une alternative limitée. Les défis de recrutement se sont aggravés, entraînant un vieillissement croissant de la main-d'œuvre. L'avenir de la pêche à grande échelle, et des pêcheurs à grande échelle dans ce scénario, semble incertain.

Conclusions et recommandations

Les quatre scénarios et les profils de pêcheurs associés offrent une exploration large des futurs potentiels pour les pêcheries de l'UE. Chaque scénario est encore possible au moment de la rédaction de ce rapport, bien que certains nécessitent des adaptations politiques importantes ou des changements géopolitiques. Les scénarios mettent en évidence les vulnérabilités et les opportunités du secteur, fournissant des perspectives précieuses aux décideurs politiques et aux parties prenantes. En ce sens, ils servent d'outils pour anticiper les défis, concevoir des politiques ciblées et soutenir l'adaptation structurée du secteur aux défis actuels et prévus. Une analyse plus approfondie des scenarii et des profils par segment de flotte et par bassin maritime pourrait permettre d'affiner ces outils et fournir des informations plus adaptées aux dynamiques régionales ou spécifiques à une flotte. Cela pourrait faire partie des prochaines étapes des discussions à venir sur l'avenir des pêcheurs de l'UE.

Quel que soit l'avenir, les scenarii et les profils de pêcheurs visent à alimenter le débat, l'investissement, l'innovation et les actions dont l'industrie de la pêche aura besoin pour prospérer à l'échéance du milieu De ce siècle et au-delà.

Dans tous les scenarii et profils, certains sujets politiques clés jugés dignes d'être approfondis émergent :

- **Promouvoir la résilience planétaire** : Investir dans une gestion adaptative et la recherche marine pour atténuer les incertitudes environnementales et préserver les stocks de poissons.

- **Soutenir la transition technologique et numérique** : Fournir des financements et des formations pour assurer un accès équitable aux technologies vertes et aux compétences numériques favorisant l'innovation dans les flottes.

- **Améliorer la compétitivité des marchés** : Renforcer les politiques commerciales, soutenir les marchés locaux et promouvoir la traçabilité pour différencier les produits européens sur les marchés mondiaux.

- **Encourager le renouvellement de la main-d'œuvre** : Répondre aux défis de recrutement grâce à l'amélioration des conditions de travail, l'inclusivité de genre et des incitations financières ciblées.

- **Favoriser la diversification** : Permettre aux pêcheurs de s'engager dans l'aquaculture, la conservation et d'autres activités de l'économie bleue, réduisant ainsi la dépendance exclusive aux pêcheries traditionnelles.

Des actions et des décisions stratégiques peuvent dès aujourd'hui guider le secteur vers la résilience, la durabilité et la compétitivité, garantissant que les pêcheurs continuent de jouer un rôle pivot dans l'équilibre des communautés

côtières européennes. Cette étude, qui constitue un jalon vers une telle vision, invite les décideurs politiques et les parties prenantes à considérer ces évolutions futures comme une base pour une prise de décision éclairée et un engagement collaboratif.

1. Introduction

As announced in the Commission's Communication on the functioning of the Common Fisheries Policy (CFP) ([9]), in October 2023, the European Climate, Infrastructure and Environment Executive Agency (CINEA) and the Directorate-general for Maritime Affairs and Fisheries (DG MARE) launched a strategic foresight study on the topic 'Fishers of the Future'. This was financed via:

- Commission Implementing Decision (EU) 2021/173 of 12 February 2021 ([10]), entrusting CINEA with the implementations of part of the European Maritime, Fisheries and Aquaculture Fund (direct management) ([11]),
- Commission Implementing Decision of 26.01.2022 on the Financing of the European Maritime, Fisheries and Aquaculture Fund and the adoption of the work programme for 2022 and 2023 ([12]),
- Decision of 08/02/2023 amending this the work programme for 2022 and 2023 ([13]).

This is the final report of the study led by **Tetra Tech International Development** (Tetra Tech) with partners **Poseidon Aquatic Resource Management Europe** (Poseidon), **Ipsos**, **F&S**, **Trinomics**, and supported by additional expertise and a **network of country experts** covering 22 European Union (EU) coastal Member States and outermost regions ([14]).

(9) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – The common fisheries policy today and tomorrow: a Fisheries and Oceans Pact towards sustainable, science-based, innovative and inclusive fisheries management, COM(2023) 103.

([10]) establishing the European Climate, Infrastructure and Environment Executive Agency.

([11]) and compulsory contributions to Regional Fisheries Management Organisations (RFMOs) and other international organisations.

([12]) Commission Implementing Decision C(2022) 371 final of 26.1.2022 on the financing of the European Maritime, Fisheries and Aquaculture Fund and the adoption of the work programme for 2022 and 2023 C(2022) 371.

([13]) Commission Implementing Decision C(2023)848 final of 8.2.2023 amending Commission Implementing Decision C(2022)371 final of 26.01.2022 on the financing of the European Maritime, Fisheries and Aquaculture Fund and the adoption of the work programme for 2022 and 2023.

([14]) Adlers, A., Bettencourt, J., Cappell, R., Cihlarova, P., Cziesielski, M., Datsi, E., Dimech, M., Gauthier, N., Hrabar, M., Hjelm, T., Ionescu, T., Kapantagakis, A., Kazlauskas, E., Kulikowski, T., Lardot, M., Malvarosa, L., Macías, J., Oja, A., Rannanpaa, S., Raykov, V., Scicluna, M., Unmack, C.

How this report is organised

Chapter 1 gives an introduction and explains how the report is structured. Chapter 2 provides the context, rationale, and objectives of the study. This is followed, in Chapter 3, by descriptions of the different phases of the study, the methodology and process applied. The presentation of four future scenarios to 2050 and eight future fisher profiles can then be found in Chapter 4. The report provides final considerations on the future scenarios and fisher profiles in Chapter 5.

The report includes also eight appendices providing a list of the information sources used, an overview of the fishers and stakeholders who contributed to the study, additional information on different outputs of the study, and some lessons learned for future foresight work.

2. Context

2.1. Policy context

The final report of the Foresight Study on Fishers of the Future fulfils the **European Commission's 2023 commitment to conduct an EU-wide participatory foresight project focused on the future of fishers and coastal communities** ([15]). By examining the evolving role of fishers in society and identifying key trends, opportunities, and threats, the study supports informed policymaking and the strategic development of a sustainable and resilient blue economy for the European Union.

This study also aligns closely with Ursula von der Leyen's political guidelines for the next European Commission 2024-2029, which underscore the importance of empowering coastal communities and ensuring the fishing sector remains sustainable, competitive and resilient ([16]).The Mission Letter to Costas Kadis, Commissioner for Fisheries and Oceans, further highlights the need to enhance support for fishers and their communities by addressing sustainability challenges, promoting innovation, and safeguarding the social and economic well-being of those reliant on marine resources.

In recent years, fisheries have been subject to **increasing pressures**, including:

- Environmental pressures: Climate change, biodiversity loss, and pollution are severely impacting the marine environment.
- Political changes: The United Kingdom's (UK) departure from the EU has added an additional layer of complexity in EU fisheries governance and introduced new conditions for access to stocks in the Northeast Atlantic.
- Economic difficulties: The conflict in Ukraine has caused energy prices to surge, reducing profit margins that were already weakened by the COVID-19 pandemic and Brexit.
- Policy and governance gaps: Slow progress in meeting environmental sustainability targets and robust data collection, as well as limited

[15] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - The common fisheries policy today and tomorrow: a Fisheries and Oceans Pact towards sustainable, science-based, innovative and inclusive fisheries management, COM(2023) 103, Brussels, 21.02.2023.

[16] Ursula von der Leyen, Candidate for the European Commission President, Europe's Choice, Political Guidelines for the Next European Commission 2024−2029, Strasbourg, 18 July 2024.

effectiveness in implementing the landing obligation to reduce unwanted catches.
- Social challenges: Declining generational renewal and difficult working conditions, which reduce the attractiveness of the sector.
- Technological barriers: Insufficient use of innovative technologies for reducing environmental impacts and increasing precision in fishing and aquaculture operations.
- Spatial competition: The growing demand for maritime space by other sectors, like renewable energy and aquaculture.

In this context, it is relevant to consider the cumulative effects of these trends on fishers. This foresight study directly contributes to this objective, offering a **forward-looking perspective** that can inform future policies and support fishers in redefining their identity, roles, and practices in the transition to more sustainable fisheries.

2.2. Rationale for the study

The European Commission (DG MARE with CINEA) initiated the **Foresight Study on Fishers of the Future** in October 2023 to explore possible future pathways for the crucial role of fishers in society, beyond the provision of high-quality seafood with a relatively low carbon footprint. Based on extensive stakeholder consultation the study was asked to identify:

- The factors and trends influencing the long-term sustainability and profitability of the fishing sector and the well-being of fishing communities,
- The identity and role of fishers beyond their core business, particularly in the conservation and restoration of the marine environment, environmental tourism, and the local development of coastal areas,
- The challenges and opportunities resulting from cooperation and synergies between fishers and other maritime stakeholders, especially in maritime spatial planning, renewable energy deployment, organisation of the seafood supply chain, circular economy, and diversification in the broader context of the sustainable blue economy.

2.3. Strategic foresight methodology

Foresight is the discipline of exploring and anticipating future possible developments to shape the preferable future. To do so, it taps into collective intelligence in a structured and systemic way. Foresight is not about predicting the future; it explores different possible futures, alongside the opportunities and

challenges they might present. Ultimately, it helps policymakers to **act in the present and impact the future** ([17]).

Strategic foresight anticipates developments (e.g. trends, risks, emerging issues) and their potential implications to draw insights for strategic planning, policymaking, and preparedness. It helps improve policy design, develop future-proof strategies, and ensure that short-term actions are coherent with long-term objectives.

Key benefits of the **collective intelligence processes** that foresight applies are that they facilitate exchanges between people with diverse perspectives, develop learning and stimulate engagement among them. They broaden the participants' horizons and help develop shared perceptions of challenges and opportunities among broad groups of stakeholders.

Strategic foresight plays an important role in the work of the Commission as evidenced, by the Commissioner for Intergenerational Fairness, Youth, Culture and Sport with responsibility for Strategic Foresight and the production of annual Strategic Foresight Reports which inform the Commission's Work Programmes and multi-annual programming exercises. Adding to this, the Competence Centre on Foresight, part of the Joint Research Centre (JRC), integrates foresight and forward-looking approaches into EU policymaking, offering strategic and future-oriented insights ([18]). Strategic Foresight has also been included in the Commission's Better Regulation toolbox ([19]).

In the present study, foresight was used to discuss possible futures of fishers up to 2050, with **fishers and their representative organisations at the centre of deliberations**. Inspiration for this study was taken from the 'Farmers of the Future' study conducted by JRC for DG AGRI. Other works, approaches and methodologies developed by the Competence Centre on Foresight also informed the study.

Chapter 3 elaborates on the applications of strategic foresight and its tools in the context of this study.

([17]) European Commission, Strategic Foresight: https://commission.europa.eu/strategy-and-policy/strategic-foresight_en.

([18]) https://knowledge4policy.ec.europa.eu/foresight_en.

([19]) See Tool #20, available at https://commission.europa.eu/law/law-making-process/planning-and-proposing-law/better-regulation/better-regulation-guidelines-and-toolbox/better-regulation-toolbox_en.

2.4. Objectives and scope of the study

The main **objective** of the Fishers of the Future study was to use foresight to project fishers in the future, to explore the changes that the profession, role, and identity of fishers might face in the long-term (i.e. up to 2050).

It explored who fishers are, and what drives them now and in the future. It examined their current hopes (wish for positive future), fears, expectations (most likely to happen) and needs to understand the evolution(s) that fishers might undergo. It also considered the possible evolution of the already existing challenges such as climate change, generational renewal, marine pollution, competition for access to maritime space, etc.

The aim was to support the Commission in anticipating the transformation of the sector to better develop transition pathways for 2050. The work did not aim to predict the future or establish a desirable future, but to explore possible trajectories, in a **participatory and inclusive manner**, based on dialogue with people in the fishing sector. The ultimate purpose was to provide a foundation for further reflection and discussion about the possible transitions of the fisheries sector, including elements to be addressed to avoid fulfilling more negative scenarios.

The **scope** of the study covered fishers operating in commercial marine fisheries and those working on board or owning an EU vessel operating in EU waters. The geographical scope was specified as EU waters within the Black Sea, Mediterranean Sea, North Sea, Atlantic waters, Baltic Sea, and the EU outermost regions. This covered 22 coastal EU Member States: Belgium, Bulgaria, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Spain, and Sweden.

This scope ruled out the inclusion of recreational and inland fishers but ruled in non-EU nationals working onboard EU vessels, as well as EU-registered vessels operating in neighbouring coastal waters, e.g. North Sea, Mediterranean. Considering the common categorisation of the EU fisheries sector into small-scale fisheries (under 12m vessels) and large-scale fisheries (over 12m vessels), both small- and large-scale fishers were considered during the study.

The **time horizon** for the projection of the future scenarios and the profiles of EU fishers is 2050.

3. Study phases and methodology

3.1. Overview of the methodology

The **approach** to conducting this study, while facilitating the engagement and buy-in of fishers and stakeholders, was:

- People-centred,
- Participatory,
- Transparent,
- Gender, age, and youth aware and sensitive,
- Geographically diverse,
- Based on multiple methods and tools,
- Process-orientated for developing, testing, and validating ideas,
- Iterative and integrated (i.e., tasks were not conducted in silos).

The **methodology** included qualitative, exploratory research and trend analysis – starting from the present and seeing where events and developments might take us. The study team used a broad range of methods, including strategic foresight, analysis of megatrends and design of profiles and personas.

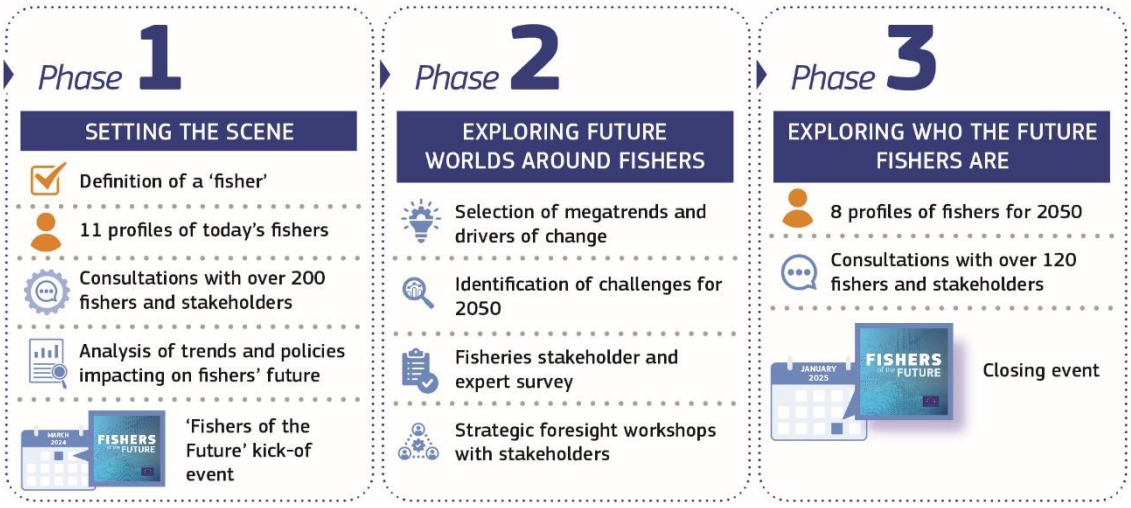
The study used also different **tools** as steps to reach a collective understanding of the research evidence and findings. It combined desk-based research and carried out primary data collection with fishers and local stakeholders through key informant interviews (KIIs), focus group discussions (FGDs) and an adapted Photovoice exercise ([20]). It also explored and validated ideas and study outputs (for instance, for the development of future scenarios and profiles of current and future fishers) during workshops with experts and EU stakeholders.

The study was conducted by a **core team of experts** in fisheries, strategic foresight and stakeholder engagement, supported by a network of **22 country experts** responsible for consultations with fishers and local stakeholder in all EU coastal Member States and outermost regions.

The study consisted of **three Phases** (Figure 1) which are described in detail below.

([20]) Photovoice is a participatory research method where participants use photography to capture and share their experiences, perspectives, and challenges related to a specific topic. Photovoice is commonly used in the fields of community development, international development, public health, and education.

Figure 1 – Study phases and activities

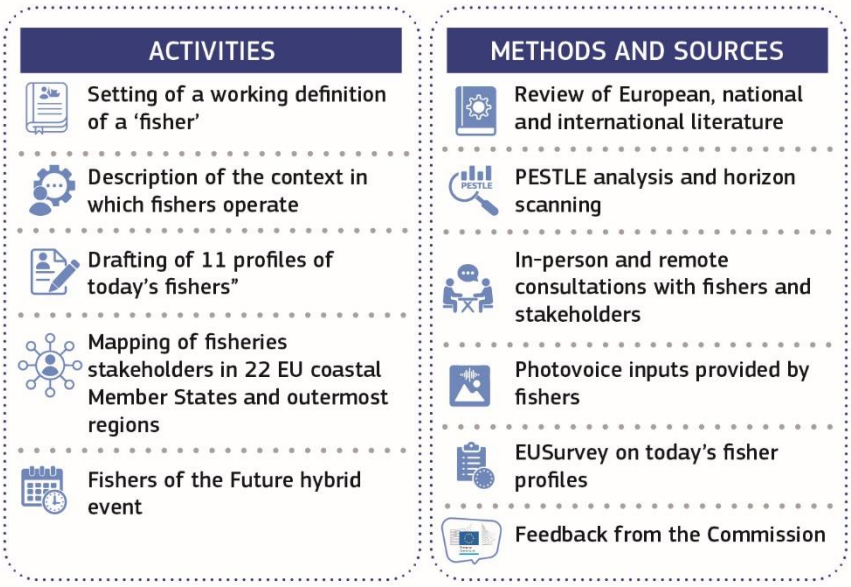


Source: Study team's own elaboration

3.2. Phase 1: Setting the scene

Phase 1 was dedicated to setting the scene for the study, exploring who today's fishers are, the environment in which the fisheries sector operates, and who the other stakeholders are. During this phase the study team also provided some insights into what may happen in the following decades.

Figure 2 – Activities, methods and sources of Phase 1



Source: Study team's own elaboration

In the sections below we describe the approach to each of the activities of this phase and how the methods and tools presented in Figure 2 were used.

A working definition of a 'fisher'

Broad characteristics were agreed upon to frame the definition of 'fisher', i.e. the definition should:

- be broad in scope rather than too specific,
- be capable of excluding all stakeholders not considered as fishers,
- not be restricted to EU nationals (given that non-EU citizens are also employed in the sector),
- not be gender or age specific or discriminatory,
- include some qualitative ideas of how fishers see themselves and their contributions to society as long as sufficiently applicable to all fishers.

From a working definition proposed in the study's Technical Offer and later discussed with fishers during the consultations, a revised **definition of a fisher** used throughout the study is provided below.

Box 1 – Working definition of a 'fisher'

A fisher is an individual earning a living primarily from fishing, usually employed on, or owning or renting an EU vessel (although some fishers operate on foot from the shore). They are normally officially recognised or registered as a fisher and are often part of an organisation which represents their interests. They may fish in EU or non-EU marine waters. They often live near the coast, have a strong sense of identity as a fisher and strong links in the local community, and contribute to social cohesion in coastal areas in the EU, to the provision of food to EU consumers, and to local economies.

The **justification for the definition** and its specific wording is that:

- 'A fisher' is gender neutral. It avoids wording that would be exclusionary, or which would perpetuate traditional gender roles, and recognises that individuals of any gender may be involved in fishing activities. An 'individual' serves to provide for any person, irrespective of gender, age, race, nationality, or religion to be included.
- 'earning a living' excludes recreational fishers, but allows for individuals engaged full-time, part-time and on an occasional basis. It is assumed that subsistence fishers do not exist in the EU (unlike in many developing countries ([21])). The definition specifically excludes any mention of the

[21] Note that the Food and Agriculture Organisation (FAO)'s Coordinating Working Party on Fishery Statistics (CWP) suggest that 'subsistence' fishers should be included within a definition of a fisher, and that a fisher should include commercial, industrial, and subsistence fishers, as well as those involved in fish farming, hatcheries, and shellfish culture operations. However, the Terms of Reference for this assignment required a different and more narrow focus.

proportion of a person's livelihood earned from fishing, recognising that for some fishers, income from non-fishing activities may also be important.
- 'marine waters' serves to exclude inland fishers (in line with the scope of this assignment).
- 'EU vessel' serves to confirm that the vessel must fly the flag of a Member State of the EU, and serves to exclude marine aquaculture and fish farmers, as well as upstream (input) and downstream (marketing and trading) sectors.
- The definition introduces some qualitative elements to the definition, but without being too definitive e.g., some crew on fishing vessels may not necessarily live in coastal areas, not all fishers are represented by associations, etc.
- The definition highlights the connections fishers have to local communities and the contributions that fishers make to society.

Exploring who today fishers are

The country experts, one for each of the 22 coastal Member States of the EU, were provided guidance by the study team through briefing meetings, and then **consulted with some 200 fishers** in the Member States and outermost regions before reporting their findings back to the study team. Individual fishers were selected for consultation based on the study team's network of contacts and each fisher's availability, while also ensuring a broad representation from those working on different sizes of vessels and using different types of fishing gear. These consultations took place both in-person and remotely, using KIIs and FGDs. Questions posed to fishers and discussed with them focussed on:

- How fishers see themselves today,
- What are their key motivations, desires and needs,
- Views about the importance and impacts of topics/trends influencing the future,
- Views about the importance of different policies impacting them,
- Which non-fisher stakeholders have significant impacts on fishers and in what ways.

In addition, several fishers voluntarily took part in an adapted **Photovoice exercise** that captured, through photographs and captions taken and written by fishers themselves: (i) a key feature of today's fishers' identity, (ii) something in their profession that will not exist in 2050, and (iii) something with a key impact on fisheries.

The country experts also conducted over **60 interviews with fisheries sector stakeholders** (who were not active fishers) in the 22 coastal Member States and outermost regions, including researchers, non-governmental organisations (NGOs), leaders of producer organisations (POs), and managing authorities.

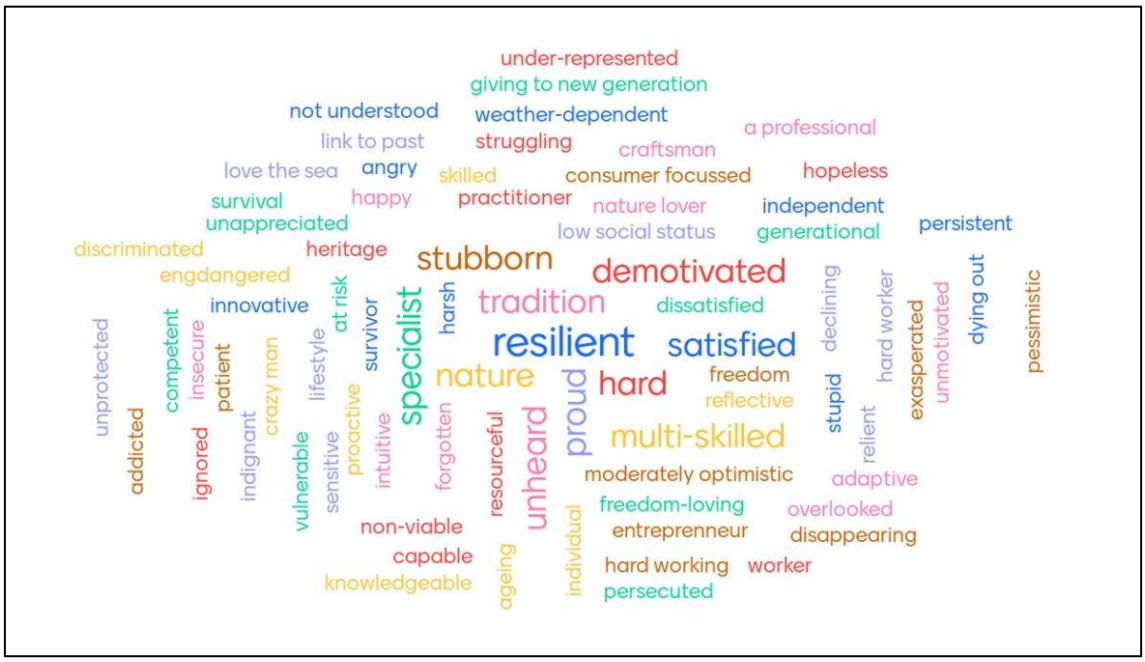
To provide some idea about the fishers currently operating in the EU and their characteristics and motivations, a series of draft profiles of today's fishers were developed by the study team based on the consultations with fishers working on small- and large-scale vessels. Academic and grey literature was also reviewed by the country experts as specific to their countries, and by the study team as more generally applicable to EU fishers and used where relevant to inform the draft profiles.

The draft profiles were subjected to validation and input by fisheries stakeholders during the study's (hybrid) **kick-off event held in Brussels in March 2024** (with feedback from remote participation at the workshop also collected and analysed). Stakeholder feedback was also obtained through an EUSurvey which ran from 14 February to 30 April 2024. All the feedback provided was used to revise the profiles. The final **profiles of today's fishers** are available on the Commission's 'Fishers of the Future' webpage ([22]).

It is important to note that, taken collectively, the profiles serve to describe today's fishers in the EU and their wide range of characteristics. However, full representativeness would require a complete statistical survey (such as an EU barometer), which was not the objective of this foresight exercise. A reading of the profiles can be enhanced when considering how fishers see themselves, as captured in the **word cloud** generated from feedback during the consultations in the Member States and outermost regions (see below). The word cloud is revealing of the conflicting emotions and diverse attributes that characterise fishers and their activities.

([22]) European Union, Fishers of the future, 2024, available at: https://oceans-and-fisheries.ec.europa.eu/fishers-future_en.

Figure 3 - How fishers see themselves in one word



Source: Country-level consultations (generated using Mentimeter.com). Note colours are automatically generated by Mentimeter and do not represent different categories of emotions or attributes.

Defining the environment the fisheries sector operates in

An extensive list of topics/trends and policies impacting fishers was compiled by the study team through a literature review. Topics and policies were classified using a **PESTLE framework** (Political, Economic, Social, Technological, Legal, and Environmental factors). The listed topics and policies were analysed through a desktop study to understand their relation to fishers and the fisheries sector in the EU, and specifically what type of impact they could have over the future.

Based on guidance by the study team, the country experts discussed the topics/trends and policies with fishers elucidating (based on scoring criteria) the likely impact (magnitude and direction) of each. An open discussion format also encouraged participants to identify any significant policies or topics not included in the predefined list. Information regarding topic and policy ratings provided by the country experts to the study team were analysed and integrated to the study's evidence-base.

Mapping stakeholders in the fisheries sector

The approach taken to map stakeholder organisations involved:

- Identification of stakeholder organisations by the country experts and study team and their inclusion in a stakeholder database. The country-

level consultations were used to obtain information on national-level stakeholders (and those potentially most important to consult during the study and influential in terms of their impacts on fishers). At the same time, the study team added EU institutions and EU-focused research organisations to the database.

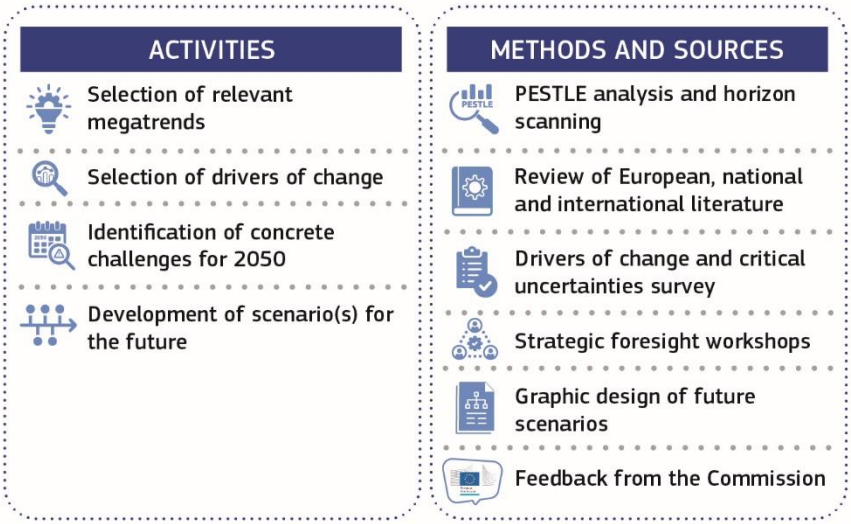
- Categorisation of stakeholder organisations identified into groups, sub-groups, roles, and geographical coverage.

The stakeholder mapping in the resulting database was used to ensure that consultation and engagement throughout the assignment was sufficiently broad.

3.3. Phase 2: Exploring future worlds around fishers

In Phase 2, we examined the context in which fishers might be living and working in 2050, through an analysis of megatrends and the drivers of change behind these, and of the concrete challenges and opportunities for 2050. Using scenario planning, we arrived at **four possible scenarios** that illustrate the potential environments in which fishers may be living and working up to the year 2050. The four scenarios uncover the most critical uncertainties facing fishers and fisheries in the future, map their potential impacts out to 2050, and identify challenges and opportunities for fishers for 2050, serving as a foundation for developing profiles in Phase 3 of this study.

Figure 4 - Activities, methods and sources of Phase 2



Source: Study team's own elaboration

The methodology and process of Phase 2 are described below and summarised above in Figure 4. The four scenarios with a 2050-time horizon are presented in Chapter 4.

Selecting relevant megatrends

The first step of Phase 2 entailed the identification of the **megatrends** that most influence the long-term environmental, economic, and social sustainability of fisheries. Input from Phase 1 formed the core of the desk research for this task, alongside foresight evidence from the European Commission and internal knowledge.

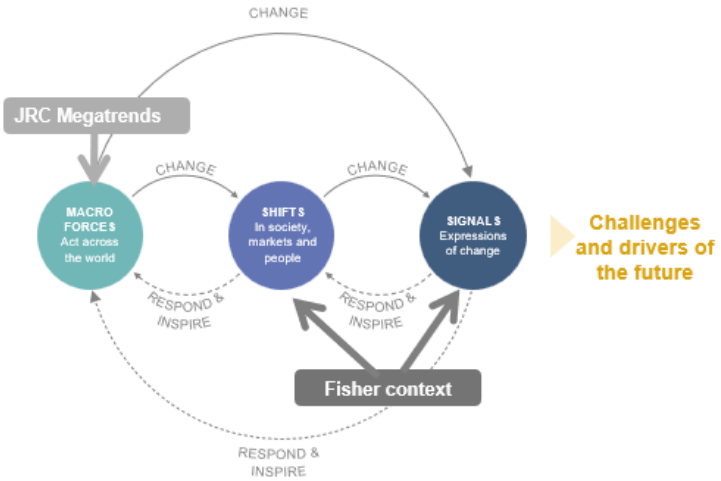
More specifically, the megatrends analysis was based on the European Commission and JRC's Competence Centre on Foresight ([23]) and their 14 Global Megatrends ([24]). The analysis was also supported by the study team's knowledge of macro forces from Ipsos' Global Trends study, a long-term trend series comprising interviews across 50 countries (including many EU Member States), and additional research to account for more recent events.

Ipsos' Theory of Change provided the framework for the analysis of megatrends (Figure 5) which demonstrates how macro forces are driving changes that fishers, and the context in which they are operating, are responding to. The 'fisher context' represents the multifaceted environment in which fishers operate, encompassing PESTLE factors outlined in the themes that emerged from Phase 1. This context is not static; it continuously evolves due to internal dynamics in shifts and signals and external macro forces. This model thus represents the **dynamic nature of change**, highlighting how the fisher context can be both affected by change, such as warming global temperatures, and drive change, such as through innovative practices.

[23] European Union, Competence Centre on Foresight, available at: https://knowledge4policy.ec.europa.eu/foresight_en.

[24] European Commission, The Megatrends Hub, available at: https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en.

Figure 5 - Ipsos' Theory of Change applied to the fisheries sector



Source: Ipsos' elaboration

Change in values can be driven from the top down by global macro forces, like ageing and climate change; from the middle by changes in values, opinions, and attitudes; and from the bottom up by individual innovations and new behaviours. This model helped us consider existing frameworks like the 14 Global Megatrends while generating drivers of change specific to the fisheries sector, thereby contributing to building scenarios with a 2050-time horizon.

We reviewed the Competence Centre on Foresight's 14 Global Megatrends, which align with the model's "macro force" level and proved valuable inputs into the process. The study team collaboratively examined these megatrends alongside key themes derived from the feedback of Phase 1 and Ipsos's global macro forces. This comprehensive analysis allowed us to identify gaps and reinforce common megatrends across all three sources, resulting in a refined subset of megatrends relevant to fisheries' long-term environmental, economic, and social sustainability, such as climate change, environmental degradation, resource scarcity, and the changing nature of work.

The result was a refined focus and description of the megatrends, tailored to the reality of fishers' experiences and the study's objectives. Appendix 3 presents the **final list of megatrends** that most affect fisheries' long-term environmental, economic, and social sustainability.

Selecting drivers of change

After finalising the selection of the megatrends, the study team conducted a PESTLE analysis to identify **key drivers impacting fishers and the fisheries sector**. The driver generation process started with the fisheries context and built

on the megatrend's work and the findings from Phase 1. Ipsos' Theory of Change was used to assess interactions between macro forces, shifts, and weak signals of change, thereby identifying the most important drivers of change.

The study team began from the "bottom-up", incorporating fishers' perspectives gathered during Phase 1 at the heart of the work. We identified **12 themes** across the 22 country reports derived from interviews, surveys, and focus groups with fishers in the 22 coastal EU Member States and outermost regions. These reflected EU fishers' concerns today and the issues they foresee in the future.

The study team then reflected on these 12 themes against the megatrends to identify additional factors that could fill any gaps. This was done by asking some key questions about each, e.g.:

- What are the key issues impacting fishers' work and worlds?
- What short, medium, and long-term factors are driving these issues?
- What other factors could be important? What role do they play?

The study team then also applied Ipsos's Theory of Change to examine the relationships between top-down megatrends and bottom-up issues raised by fishers. Combining these factors with additional information allowed us to define an initial list of drivers of change.

The initial draft list was tested internally with the study team members to ensure we had incorporated fishers' perspectives and adjusted as needed. The study team then presented the list of drivers to DG MARE's internal Steering Group, which provided an opportunity to explore the implications and trajectories of the drivers. After review, the study team created a **refined list of 28 drivers**, which were tested with strategic stakeholders through an online survey. This iterative process allowed the study team and DG MARE to continuously input and critique the driver development process. The drivers that were carried forward as critical uncertainties were then further refined throughout Workshops 1, 2 and 3 with collaborative input from stakeholders (see below). Appendix 4 presents the final list of drivers of change behind the megatrends that most affect the long-term environmental, economic, and social sustainability of fisheries.

Identifying concrete challenges for 2050

From the driver analysis, the study team derived a set of challenges fishers could face in 2050. These challenges can be seen as questions, and the answers to these will dictate how the world evolves for fishers across the EU. Together with the drivers, they acted as a **stimulus for the scenario-generation discussions** the study team conducted later.

The challenges were established through a creative analysis of the drivers. By combining drivers across the PESTLE categories, the study team formulated a set of eight challenges:

- Nature – a competitor or a collaborator?
- Sharing congested coasts and seas,
- Building the fleet of the future,
- Drawing lines in the sea,
- Fishing – a vocation or a business?
- Surviving a 2+ degree sea,
- Changing trade and tastes,
- Keeping up with regulation.

Appendix 5 presents the concrete challenges for 2050.

Surveying stakeholders on drivers of change and critical uncertainties

Broad engagement of experts and strategic thinkers across EU fisheries was crucial to ensuring validation and buy-in of the drivers identified. For this, the study team launched a live open-link survey that was shared with strategic stakeholders identified through the mapping of stakeholders under Phase 1.

The survey was designed to target stakeholders with a strategic perspective on the EU fisheries sector, as depicted in Table 1 below.

Table 1 – Survey target audience

Stakeholder group	Relevant subgroups
National government and platforms	Ministries, Control Agencies, Fisheries Local Action Groups, Producer Organisations (POs)
International organisations and platforms	Advisory Councils, EU institutions and relevant EU technical agencies, relevant international organisations
Academic and research	Fisheries research institutes and experts
Civil society	International and national NGOs, representative professional organisations, EU social partners, fishers

Source: Study team's own elaboration

The survey aimed to validate the drivers of change to 2050 and identify critical uncertainties. For this study, **critical uncertainties** were defined as those drivers of change that have a highly uncertain outcome and the potential to be most impactful to the way the future may unfold. Through this survey, we asked stakeholders to give us their view on two dimensions of each driver: the **impact dimension** which sought to measure how significant each driver's influence could

be on the future of fishers to 2050; and the **uncertainty dimension** which sought to measure the degree of predictability associated with the outcome of the driver on the future of fishers to 2050.

It is important to note that the survey did not aim to create a fully "representative" survey of opinions on the drivers (nor indeed could). Instead, the results were intended to stimulate the scenario planning workshops and spark debate and discussion among the strategic stakeholders we engaged in the second phase of Phase 2.

There were **180 respondents** to the survey, providing a good and balanced representation of all stakeholders in the industry. The two largest groups were fishers/industry representative bodies (31%) and NGOs (24%) who collectively made up just over half of the sample. Their focus was primarily national (39%) or EU-level (28%), with representation across various sea basins, notably the Baltic Sea (38%), Northwest Waters (37%), North Sea (34%), and Western Mediterranean Sea (34%).

When analysing the survey results, the study team created selection criteria to determine which drivers should be considered critical uncertainties. We calculated average impact and uncertainty scores for each driver based on the percentage of respondents who classified them as most impactful and most uncertain. This allowed us to identify drivers that equalled or exceeded both average scores. These were deemed critical uncertainties, as they are considered to have equal or greater impact and uncertainty in relation to all tested drivers.

Through this process, the study team identified **12 critical uncertainties** (see Appendix 6 for the full list) which were then further refined with strategic stakeholders during the workshops (see below). This list ultimately helped to define scenarios for the study.

Developing future scenarios

Strategic workshops

The process of refining the drivers of change, identifying critical uncertainties, and developing the scenarios with a 2050-time horizon was carried out collaboratively across **four strategic workshops**. Using a **2x2 scenario planning technique** enabled the study team to generate contrasting scenarios in an intuitive way. This approach is often used for testing medium-to-long-term policy because it ensures that policy direction is robust within a range of environments. The steps involved were firstly to evaluate all potential drivers of the future of fishers against two key dimensions: impact and uncertainty. Then

the list of drivers was gradually reduced to the two deemed as the most critical ones. Finally, participants characterised the two potential extreme situations for these two drivers and used them to build a “map” that created four feasible “scenarios” to be discussed.

Here we provide an outline of the concrete steps and activities that took place in all workshop sessions. These workshops helped to frame the scenarios and develop the narratives of what fisher’s lives might look like in each scenario.

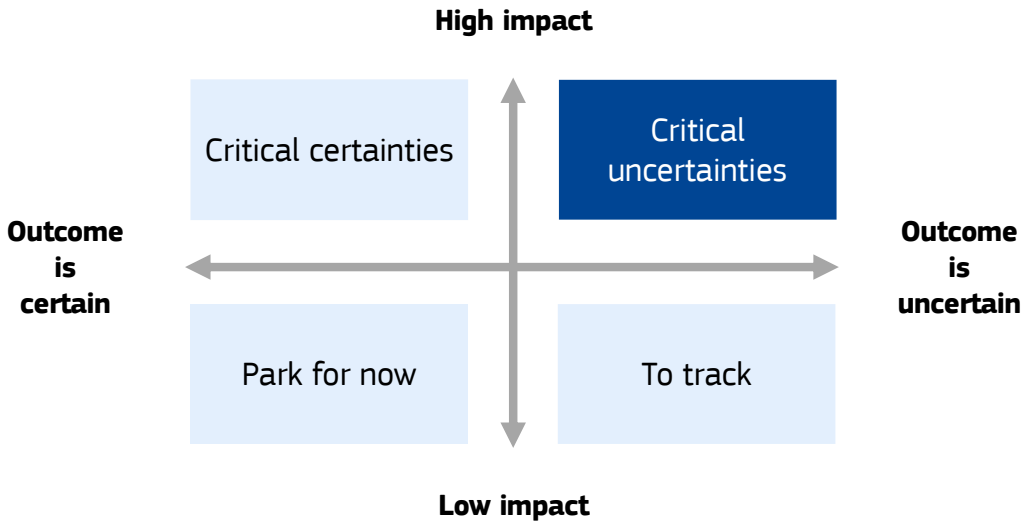
The first workshop occurred in person at the event on 19 March 2024 in Brussels. The next three workshops were held online using Microsoft Teams on 4 April, 14 May and 6 June 2024. Stakeholders from a similar range of organisations and perspectives to those included in the survey were invited to participate in the workshops (this included social partners, Advisory Councils, interest groups (environmental and fisheries), fishers, fisheries experts and relevant EU bodies. This ensured that everyone with an interest in the future of the industry had an opportunity to contribute (see Appendix 2 for a list of organisations which participated in the workshops).

Workshop 1 (19 March 2024, in-person)

Similarly to the survey, in the first workshop, the study team used an impact vs. uncertainty matrix (

) to **map the full list of drivers of change** according to their impact and uncertainty to the future of fishers. In this workshop, the study team took inputs from the survey to a more strategically minded subset of stakeholders to validate the survey results and determine the final list of critical uncertainties.

Figure 6 – Impact vs. uncertainty matrix



Source: Study team's own elaboration

Workshop 2 (4 April 2024, online)

The second workshop aimed to reach a stakeholder consensus on the critical uncertainties and to start building **axes of uncertainties**. The aim of axes of uncertainties is to create a continuum between two opposite uncertain outcomes – the way a driver may play out. These are not necessarily positive or negative – they are just the extremes of the uncertainties. This process involved creating a polarisation of drivers to opposite extremes.

Workshop 3 (14 May 2024, online)

Scenario planning is inherently iterative and highly collaborative, with the process itself being as crucial as the outcomes. It requires a flexible, open approach by the participants to ensure effective incorporation of feedback and achievement of consensus.

During the first two workshops, the study team found it was sometimes difficult for participants to fully grasp the methodology and process of scenario planning. In response to these difficulties, and with guidance from CINEA and DG MARE, the study team adjusted the plan for the third workshop and agreed to conduct a fourth one. The third workshop thus served four purposes:

- **Revisiting key concepts*:*** To provide participants with an additional opportunity to revisit and refine the drivers and axes of uncertainty explored in the previous workshops.

- **Enhancing process clarity*:*** To offer a more comprehensive explanation of the scenario building process and its objectives.
- **Deepening stakeholder engagement*:*** To foster a more inclusive dialogue that captured diverse perspectives, ensuring that all viewpoints were not only heard but also thoughtfully integrated into the scenario development process.
- **Facilitating consensus on critical uncertainties*:*** The overarching goal was to facilitate a more formal and structured consensus among stakeholders regarding the drivers which should be taken forward as critical uncertainties. This consensus would directly inform the selection of axes of uncertainty for the scenario matrix, ensuring that the resulting scenarios would be built on a foundation of collective insight and agreement.

Following Workshop 3, the study team, in close consultation with CINEA and DG MARE, undertook the task of selecting the most suitable axes of uncertainty for the 2x2 scenario matrix. After careful deliberation, the two axes which emerged as the foundation for the scenario narratives were **"consumer and market dynamics"** and **"climate change and fisheries resources"*.*** These axes were chosen for their potential to generate compelling and diverse scenarios, which would create rich narratives and would allow the stakeholder group to explore a wide range of implications for the future of fishers.

Workshop 4 (7 June 2024, online)

Ahead of the final workshop, the study team created **four outline (or "straw man") scenarios**, developed iteratively in close collaboration with CINEA and DG MARE. The study team presented these to participants in the final workshop for them to interrogate and explore.

During the final workshop, participants critiqued, interrogated, and refined them to help build out the narratives of the four scenarios with a 2050-time horizon.

Having finalised and agreed on a set of four scenarios, the study team produced **four draft narratives** for CINEA and DG MARE to discuss and validate. These draft scenarios were also shared with workshop attendees to gather feedback, and were then further refined based on their input, along with insights from the Commission. The study team focused on developing rich descriptions of the narratives and explored their implications for the fishers of the future. These are 'stories from the future': word outputs, detailing each scenario, including the key drivers operating in them and the implications of these for EU fishers.

Upon finalisation of these narratives, the study team worked on graphic illustrations of the scenarios to ensure they are visually engaging and clearly convey the potential futures that the study explored. These four scenarios were

one of the main inputs for developing future fisher profiles for 2050, presented in Chapter 4.

The final scenarios were created by combining the following **two axes**:

- **Consumer and market dynamics**: This north-south axis represents the overall demand for fish caught by EU vessels operating in EU waters compared with the available supply. It considers factors such as import competition, consumer demand, species preferences, ethical concerns, and market trends.

  We have characterised the two ends of this axis as follows:

  North: High demand for EU-caught fish.

  South: Low demand for EU-caught fish.

- **Climate and biodiversity changes in marine ecosystems**: This east-west axis is concerned with the impacts of climate change, biodiversity changes in marine ecosystems (encompassing biodiversity loss, fish stock depletion and change of distribution) and pollution levels. It considers the extent of sea-level rise and ocean temperature, the state of coastal and habitat degradation, pollution, biodiversity loss, fish stock displacement, and species variation and their impact on fishers' operations.

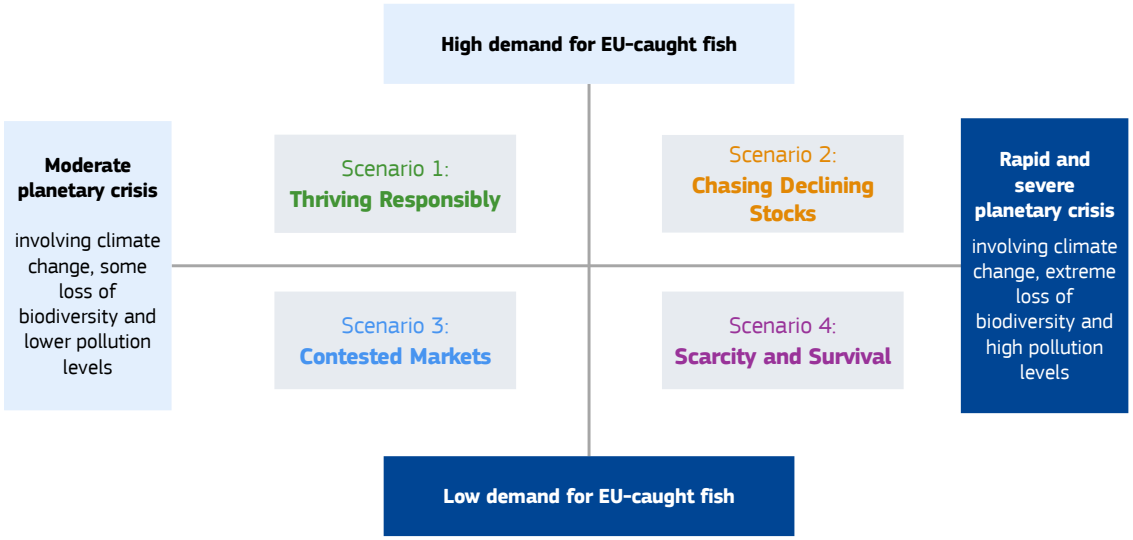
  We have characterised the two ends of this axis as follows:

  West: Moderate planetary crisis involving less extreme climate change, some loss of biodiversity and lower pollution levels.

  East: Rapid and severe planetary crisis involving climate change, extreme loss of biodiversity and high pollution levels.

Each scenario encompasses a complex interplay of various factors in addition to these two main dimensions that have been used to build the scenarios. These axes are intended to provide a framework for exploring a range of scenarios and the potential challenges and opportunities that the fishing industry may face in the coming decades. Figure 7 below presents the intersection of these two axes, showing how they were used to create four alternative scenarios for 2050.

Figure 7 – Scenario matrix



Source: Study team's own elaboration

These scenarios encompass a range of possibilities, from adapting to a warming ocean with rising sea levels and shifting species distributions, to navigating the complexities of a sustainable blue economy characterised by technological advancements and evolving consumer preferences. Each scenario examines the potential impacts on fishers' livelihoods, the role of technology and innovation, and the evolving dynamics of the global seafood market.

Structure of the scenarios

An exploration of the four scenarios is presented in **Chapter 4**, each of which is set out as follows:

- **Scenario title**
- **Scenario snapshot:** A summary of the scenario, with a key focus on the primary drivers of 'climate change and fisheries resources' and 'consumer and market dynamics'.
- **Primary and secondary drivers:** Sets out the primary drivers and their specific axes that frame the scenario, and the secondary drivers (the remaining critical uncertainties) explored in each.
- **Scenario timeline:** The timeline charts a potential pathway towards the 2050 scenario, recognising that the future is inherently uncertain. Near-term projections (up to 2040) are outlined in five-year increments, while longer-term projections (2040-2050) are presented as a signal segment, reflecting the nature of foresight, which becomes progressively less precise as it moves further into the future.
- **Scenario narrative:** The full narrative for each scenario that initially explains the interplay between the specific axes of the two key drivers and then explores how the secondary drivers would play out depending on the

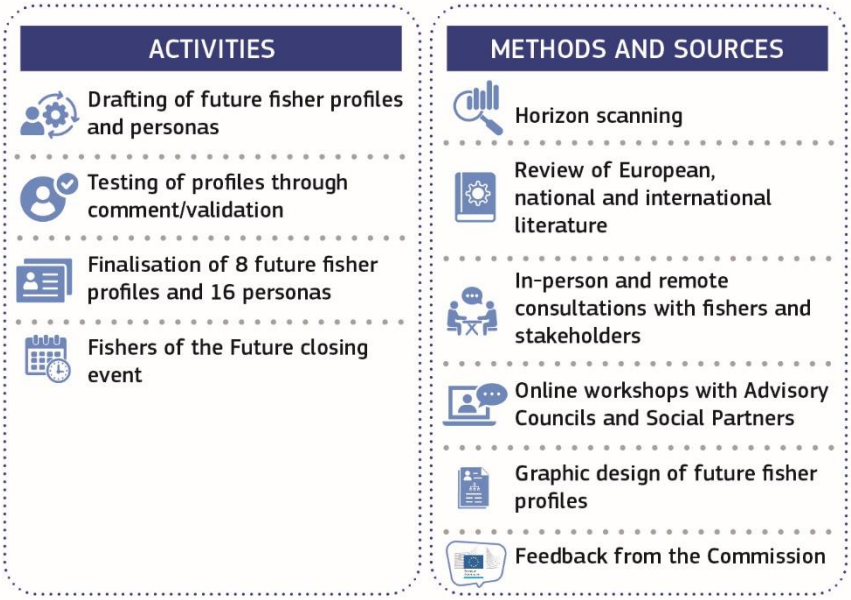
axes they are responding to. These act as rich depictions of different plausible futures and the impact on EU fishers.

- **Scenario illustration:** The full narrative for each scenario includes an illustration summarising the key elements of the narrative. They are intended to bring the scenarios to life in a dynamic way but should not be taken to represent specific predictions of catches, vessel sizes or configurations or fisher characteristics.
- **Thought kick-starters**: These act as prompts for further discussion and exploration of the implications of each scenario.

3.4. Phase 3: Exploring future fishers

In Phase 3, the study explored the future of EU fishers and the changes and adaptations they might go through up to 2050, based on the four scenarios developed in Phase 2. This was done through the development of **profiles of future fishers for 2050**.

Figure 8 – Activities, methods, and sources of Phase 3



Source: Study team's own elaboration

The methodology and process for Phase 3 are described below.

Drafting future fisher profiles and personas

Draft profiles of future fishers in 2050 were developed for the four future worlds developed during Phase 2 of the study. For each of the scenarios, **one small-**

scale and one large-scale fisher profile was developed to provide a balance between the common segmentation of vessels into those under-12m and those over-12m. Each draft profile also contained **two 'personas'** (hypothetical individual fishers) to bring a more personal element to the main profile.The draft profiles (and personas) were prepared by the study team in close collaboration with CINEA and DG MARE through an iterative process during July and August 2024, bearing in mind who today's fishers are ([25]), the state of the sector and related trends, and the future scenarios developed during Phase 2.

Consulting fishers and stakeholders

Two parallel strands of consultation were completed, both of which generated an enormous amount of useful feedback for the study team.

Consultations with fishers by the country experts (September - October 2024)

The country experts were guided by the study team and approached small-scale and large-scale fishers to gather their views on the draft future profiles. Consultations took place both remotely (using telephone and video-calls) and in-person where possible, through a mix of KIIs and FGDs. To reduce consultation fatigue and the difficulty of engaging directly with fishers on a long-written document containing all the profiles, small-scale fishers were asked to read and comment on the small-scale fisher profiles, and large-scale fishers on the large-scale fisher profiles. Profiles were translated into national languages where necessary by the country experts. The country experts outlined the contents of both the scenarios and profiles and facilitated discussions. Comments about the plausibility, likes, dislikes (based on the trends and drivers of the future scenarios) and suggestions for modifications to the text were systematically noted.

Comments were collected from a total of **109 individuals**, of whom 106 were fishers (58% small-scale, 42% large-scale), with 92% men and 8% women. Comments from fishers were submitted to the study team for analysis and reflection. The country experts' own professional feedback about the profiles was also submitted to the study team.

([25]) The profiles of today's fishers developed under Phase 1 have informed the profiles of future fishers in 2050, but they are not and cannot be extrapolated forwards. Thus, there is no link between any profiles of future fishers in 2050 and profiles of today's fishers.

Consultations with Advisory Councils and Social Partners by the core study team (September 2024)

All 11 Advisory Councils (ACs) and EU Social Partners (SPs) were sent the draft profiles of future fishers in 2050. The ACs/SPs were invited (up to 5 members per AC and SP) to provide their oral feedback during one of **three online workshops** (each lasting 3 hours) organised by the study team. These workshops were attended by 20 representatives from a total of ten ACs and SPs. An outline of the scenarios and draft future profiles under each scenario was presented by the study team to the ACs and SPs represented at the workshops, followed by an open discussion on their contents, notably on their plausibility given the future world scenarios developed during Phase 2, and any specific text which warranted revision. Detailed records of contributions and suggestions for modifications were kept by the team. In addition, ACs/SPs Secretariats were also offered the opportunity to coordinate **written feedback** from their members during September and to communicate this written feedback to the study team.

Finalising future fisher profiles (and personas)

Every item of feedback collected during the consultations with fishers, ACs and SPs (see above), of which there were hundreds, was reviewed by the study team to consider whether and how each comment should be addressed. Many comments provided were supportive of the plausibility of the draft profiles (and related personas) for each of the four future worlds, noting the general limitations of short profiles to represent the variety of thousands of small- and large-scale fishers that there will be under each of the four future scenarios.

While some of the suggestions provided did not result in changes to the text of the profiles, because, for example, a comment was contradicted by others or changes would not have been consistent with the logic of the profiles considering the different scenarios, nevertheless many comments and suggestions for improvements were acted on.

Both the revised future profiles and the justification for changes or lack thereof were reviewed by DG MARE before the text of the profiles of future fishers in 2050 was considered final.

Upon finalisation of the text of the profiles, a final step was the incorporation of graphic illustrations into the profiles to help convey the potential futures explored in the study and the characteristics of future fishers in 2050.

A **table summarising the key features** of the profiles of future fishers in relation to the main drivers of change under each scenario is available in Appendix 7.

Each profile also includes a short ‘tag line’ to describe the profile in a few words and to help distinguish the profiles from each other, along with the two ‘personas’. The personas provide examples of who future fishers from different Member States and outermost regions could be across the four scenarios. They are not intended to show the most representative two individuals under any specific profile.

It is important to note that these final profiles for small- and large-scale fishers under each scenario are intended to be illustrative and plausible of the thousands of individual fishers that will exist in 2050, and to outline key fisher characteristics. By virtue of the scope of this study and the foresight methodology, they cannot be expected to be representative of all fishers under any one scenario. They are meant to describe who fishers could be in the future given the four scenarios developed during Phase 2 and the main drivers of each scenario. Thus, it should be recognised that it is not possible for the profiles to cover all the intricacies, nuances and differences of fishers given the wide range of fishing metier and the different sea basins in the EU. The profiles serve to provide the main headline trends, from which further analysis could reflect on more specific circumstances, as part of continuing the discussions on the future of EU fishers.

3.5. Engaging and communicating with stakeholders

The study was implemented in a **participatory and inclusive** manner, engaging with a broad range of stakeholders across the EU, particularly those directly involved in the fisheries sector, through a dialogue-based approach. As evidenced in the previous sections, the study team ensured extensive and close interaction with fishers, policymakers, representative bodies, producer organisations and citizens more generally at different stages of the study to develop a shared understanding of the challenges and possible future pathways for the sector. **Co-creation** therefore played a central role in this study, with fishers and stakeholders providing input and actively contributing to shaping its findings.

Figure 9 – Stakeholder engagement process

Source: Study team's own elaboration

As explained previously, the **engagement process** (Figure 9) included a range of methods such as in-person and remote KIIs, FGDs and adapted Photovoice exercise with fishers in the EU 22 coastal Member States and outermost regions which were conducted by the study's network of country experts and in the local languages (see sections 3.2 and 3.4). The engagement process included also a survey of fisheries stakeholders, scenario development workshops with fisheries experts (see section 3.3), meetings with Advisory Councils and Social Partners (see section 3.4), and general communication and dissemination through a study kick-off event (Box 2), social media and the Europa website ([26]). Fishers from the 22 EU coastal Member States and outermost regions, along with fishers' representative bodies, civil society organisations, national, regional and EU institutions, international organisations, and academia participated in these activities.

([26]) The study produced factsheets providing an overview of the study and its phases in concise, plain language and one-page articles on the progress of the study that were disseminated through DG MARE's newsletter. The study factsheets and articles are currently available in the Europa website (https://oceans-and-fisheries.ec.europa.eu/fishers-future_en). Collectively, these communication materials enabled stakeholders to follow the progress and outputs of the study. They also served to announce events and opportunities to contribute to the study.

Box 2 – 'Fishers of the Future' kick-off event

The 'Fishers of the Future' kick-off event, held in Brussels on 19 March 2024, brought together 134 participants in a hybrid format, with 41 attending in person and 93 online. Organised by DG MARE, Tetra Tech and partners, the event gathered key stakeholders, including fishers' representative organisations, national authorities, fisheries management bodies, researchers, marine sector stakeholders, civil society organisations, and representatives from EU institutions.

Deputy Director-General Kęstutis Sadauskas emphasized the importance of the study exploring the role of fishers by 2050, acknowledging the rapid changes facing the sector. The event introduced the study's first-phase findings and invited stakeholder feedback to shape the next phases. A panel discussion featuring fishers and experts highlighted key challenges, including society's perception of fishers, Brexit's impact, adaptation of fishing techniques, and the need for upskilling. Participants also engaged in breakout sessions, discussing profiles of today's fishers and the study's identified challenges, while stressing the importance of gender, sea basin, and vessel size dimension in the profiles for 2050.

To close the Fishers of the Future Foresight Study, the Commission, Tetra Tech and partners will hold a **hybrid event on 14 January 2025 in Brussels**. The objective of the event is to share the results of the study with stakeholders and relevant target audiences. The event will include a presentation of the study and its results and a panel discussion with DG MARE and fisher representatives.

4. Future scenarios and fisher profiles up to 2050

This chapter presents **four exploratory future scenarios**, developed as previously described in section 3.3.

Each scenario includes:

- A **title and illustration** that aim to communicate the essence of the scenario,
- A **snapshot** of the key features of the scenario,
- An analysis of how the **primary drivers** (that were used to create the scenario) and **secondary drivers** look like in that version of the future,
- A **timeline** showing how it is expected the world of fishers changes between now and 2050 to create that scenario,
- A detailed **narrative** discussing how the sector would look like in that scenario, and the challenges that fishers would face,
- Some **thought kick-starters** highlighting the issues the sector would need to confront when thinking about this scenario.

Following the description of each future scenario, a **small-scale and a large-scale fisher profile** are presented. As noted earlier, each profile is also supported by two 'personas' to bring a more personal element to the main profiles. The personas provide examples of who future fishers from different Member States and outermost regions could be across the four scenarios and are not intended to show the most representative two individuals under any specific profile. The profiles (and personas) are only illustrative of the thousands of individual situations and fishers that will develop in the coming decades.

To develop the profiles of future small-scale and large-scale fishers under each scenario, we considered some of their key features as of today, as follows:

- **Small-scale fishers (SSF)** are those who own or work onboard vessels that are **under 12m** in length ([27]). Typically, but not always, they fish in inshore coastal areas of the EU Member State in which they are registered, going out to fish and returning to shore the same day, with catches being landed fresh (e.g., on ice), rather than frozen, for immediate sales locally. Small-scale fishers predominantly use passive fishing gears (e.g., fixed

([27]) There is much debate about the segmentation of the EU fishing fleet into categories. For the sake of the study, and following STECF classification, we chose to use the size of the vessel (above or below 12 meters) which fishers own or work on as being reflecting of whether they are considered as small-scale fishers or large-scale fishers. STECF uses this 12 m length to define small-scale coastal fleet but adds considerations about the type of gear used (passive or active).

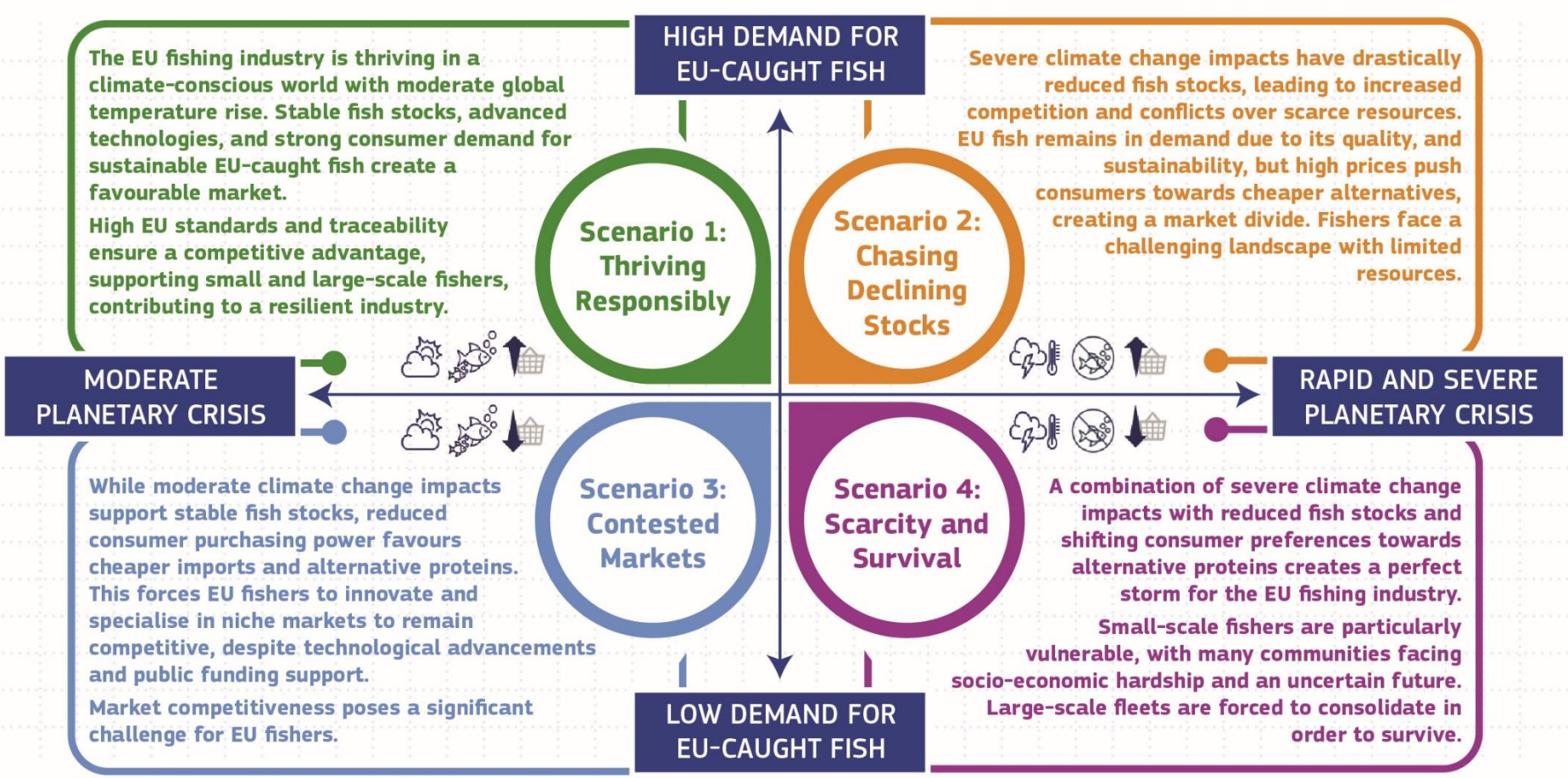
nets, pots), and sometimes active gears (e.g. dredges) and, given the size of their fishing vessels, generally work alone or alongside 2-3 other crew. They catch a wide range of species, but often focus on high value demersal, crustacea and mollusc species. Vessels are most usually made from wood or fibreglass, with decked vessels normally using inboard diesel engines, and undecked smaller vessels using inboard diesel or outboard petrol engines. Technology onboard to communicate, track the weather and find fish can be rudimentary, but is becoming more accessible thanks to the development of IT and smartphones.

- **Large-scale fishers (LSF)** are those that own, manage, or work onboard vessels that are **over 12m** in length. Vessels tend to fish in EU waters, or in waters outside of the EU, for example on shared stocks in northern waters, making fishing trips lasting several days, weeks or even months. As vessels typically have refrigeration systems onboard, fish may be landed in fresh or frozen form, and, in some cases, following processing onboard. The catches made by fishers on large-scale vessels are often traded and sold far away from the point of landing. Fishers are more commonly employed on a full-time basis compared with small-scale fishers, and many work for large corporate interests (sometimes from other EU Member States) that own multiple vessels. Vessels are most commonly made from steel and use inboard diesel engines. Fishers are engaged in catching a wide range of species, using both active gears, such as trawls and purse seines, and passive gears, such as fixed nets and pots. In 2025 many of these vessels are already using sophisticated technology to locate fish, process onboard, track the weather, and to communicate about the marketing of their catches while still at sea.

4.1. Overview of scenarios

Figure 10 provides a summary of each scenario, highlighting their key drivers and potential implications for the EU fishing industry. Following this, we present each scenario with its related fisher profiles.

Figure 10 – Scenarios overview



4.2. Future scenarios and fisher profiles

Scenario 1: Thriving Responsibly

Snapshot

By 2050, the world has limited global temperature rise, to a moderate increase ([28]) above pre-industrial levels. The EU has met its emission reduction targets and contributed to curbing biodiversity loss, including through improved implementation of the CFP for the exploitation of fish stocks and other environmental policies. The EU has also invested heavily in marine research and adaptive management strategies to mitigate the impacts of changing water temperatures and species distributions. Other EU policies have helped manage pollution of waters. As a result, fish stocks are stable. Significant investments have helped EU fishers integrate advanced technologies into their fleets,

([28]) In these scenarios, climate change severity levels are defined in accordance with the Intergovernmental Panel on Climate Change (IPCC) report. 'Moderate' climate change refers to a global mean temperature increase of approximately 2°C above pre-industrial levels, while 'very severe' climate change denotes an increase of 3°C or more.

supporting their transition to carbon neutrality, traceability and ability to meet the demand for EU caught fish at a reasonable cost. Continuous consumer demand for fish has helped to support existing regulatory measures focused on eco-friendly practices, supported by labelling and certification schemes. The EU continues to be a strong advocate for food safety and sustainability at an international level, along with a growing number of third countries.

Key drivers in this scenario

Scenario 1 – Thriving Responsibly. Primary drivers of change ([29])

- **A moderate planetary crisis** where worldwide efforts have managed to limit the impacts of climate change, biodiversity loss in marine ecosystems and pollution levels. While these impacts are still considerable, under this scenario they are not as severe as some of the current worst-case scenarios are projecting.
- **Demand for EU-caught fish is high**, making a ready market for EU consumers wishing to purchase quality and sustainably sourced seafood at a reasonable price. A level-playing field for EU fishers with importers of fish is supported through EU rules on the sustainability of imported fish, and there is strong demand for 'local/national' in terms of buyer preferences.

Scenario 1 – Thriving Responsibly. Secondary drivers of change ([30])

- **Geopolitical landscape,** although conflicts and disputes over sovereignty and access to marine resources may arise periodically, the unprecedented international cooperation to offset environmental crises has led to a less conflictual setting.
- **Interactions and conflicts with coastal communities** still exist but have decreased thanks to stronger maritime spatial planning. Compromises have been made in search of solutions for all actors.
- **Increasing use of (new) technologies**, in the form of Artificial Intelligence (AI), new devices and software have improved onboard handling practices, identification of fish, gear selectivity, fuel efficiency, and fisheries science.
- **Greater availability and quality of scientific data** (in part due to new technologies) have improved the quality of fisheries sector governance and decision-making, and stakeholder support for regulations.
- **Vessel costs (investment and upkeep) have risen** with the need to implement new technologies, a green transition, and safety enhancements but these have been managed through more effective public and private funding.
- **Funding,** while overall public funding has been more limited in other areas, the focus on the planetary crisis has resulted in continued levels of public funding for the energy transition, and sustainability of stocks.

([29]) The primary drivers of change are the two critical uncertainties that were prioritised during Workshop 3 (see section 3.4). These axes make up the foundation of the scenarios.

[30] The secondary drivers of change are the remaining critical uncertainties. During Workshop 4 (see section 3.4), stakeholders discussed what each of these secondary drivers might look like in each of the four scenarios, exploring their interplay with the foundational axes. These discussions are reflected in the scenario narrative.

- **Fisher demographics and recruitment challenges** continue to be an issue for the industry, but modernisation efforts and enhanced safety measures have broadened the pool of potential fishers to include more young people and women.
- **The nature of work in the fishing industry is changing** with more emphasis on sustainable practices and a greater role for technology, both of which have required significant efforts in education and skills development.
- **Fishing regulations and governance** are focusing on food safety, fisher welfare, and sustainability.

How did we get here?

This timeline provides a general overview of the key events and issues that could lead to Scenario 1: Thriving Responsibly in 2050.

2025-2030	2030-2035	2035-2040	2040-2050
• Major environmental crises across the world, including in the EU, become regular events. As a result, food safety and food security become prominent on the agenda, including for fish products. • Countries decide to accelerate their concrete measures to limit global warming, biodiversity loss and pollution to a moderate increase above pre-industrial levels. • Marine aquaculture farms develop, including offshore in combination with the development of Offshore Renewable Energy (offshore wind farms).	• The EU gains new momentum to push ahead with its comprehensive Green Deal, outlining a roadmap for achieving carbon neutrality by 2050. • The EU establishes a network of marine protected areas to protect vulnerable ecosystems and biodiversity, meeting the 30x30 target. • The global community agrees on an updated set of Sustainable Development Goals (SDGs) that include specific targets for sustainable fisheries and ocean health. • Consumer awareness of food safety and sustainability grows, affecting their purchasing choices.	• Significant progress is made in reducing greenhouse gas (GHG) emissions from the fishing industry through the adoption of cleaner technologies and operational practices. • New EU legislation introduces stringent rules to limit seafood imports that do not meet the EU's food safety, environmental and social sustainability standards.	• Advanced technologies, such as autonomous vessels and underwater drones, are adopted in the fishing industry, improving efficiency and data collection. • The EU achieves its goal of carbon neutrality.

Scenario narrative

Key driver 1: The impact of the planetary crisis is moderate

Increasingly destructive climatic events in the 2020s have sparked **unprecedented international cooperation** to fight the environmental crisis along with significant technological advancements achieved in the 2030s and by 2050, **the planet is stabilising.**

The EU has met its emission reduction targets as part of the European Green Deal. Biodiversity loss has been curbed through the improved implementation of the CFP, thus supporting sustainable exploitation and relative resilience of EU fish stocks. New legislation has mandated significant improvements in reducing ocean pollution, with advanced technologies enabling more effective and efficient progress. Focus on the restoration of natural coastal ecosystems and limits to other anthropogenic impacts has helped curb **the adverse effects of climate change,** including rising sea levels.

By 2050, despite some mitigation of the worst effects of climate change, the **condition of EU waters** remains sub-optimal. EU policies have made a difference so that levels of eutrophication, acidification, and marine pollution (plastic litter) have all fallen compared with highs in the 2020s. However, they are still higher than ideal. While overall fish stocks are relatively stable thanks to mitigation efforts, the distribution and abundance of key species are shifting, creating both challenges and opportunities for EU fishers. Some stocks face continued pressure, leading to reduced quotas and economic hardship for fishers who rely on these species.

In response to the changing water temperatures and chemistry, and shifted species distributions, the EU has invested heavily in **advanced marine research** and **adaptive management strategies**. This data is used to develop sophisticated models that predict fish stock fluctuations, allowing for the implementation of dynamic quotas that adjust to changing environmental conditions. However, concerns have been raised about the stability of these quotas, with some arguing that frequent fluctuations create uncertainty for those who wish to invest in expanding their operations.

Despite these challenges, the EU remains committed to ensuring that fishing is sustainable while maximising yields. Northern species have moved northward, while southern species have expanded their range. **Major technological advances** have enabled the EU fleet to effectively deploy selective fishing gear, and enhanced monitoring systems have helped mitigate the mixed impacts on catches, economic benefits, and the livelihood of fishers.

The EU continues to be a strong advocate for food safety and sustainability at the international level along with a growing number of third countries. EU **standards for food safety and sustainable fisheries** are still among the highest in the world, but many countries are catching up, including through the training offered by the EU on quality control and sustainable management practices. The improved environmental situation and related EU standards enable fishers to operate in reasonable stability and predictability, but it requires ongoing investment in sustainability and compliance measures to keep up with internal EU competition and growing competition from fleets in third countries.

Conservation efforts to protect coastal resources have resulted in restrictions on both fishing and other anthropogenic activities in these areas, resulting in decreased numbers and some consolidation of fleets. New and strong stakeholders have emerged, including renewable energy companies, eco-tourism operators and offshore aquaculture production, (including in combination with offshore wind farms). These stakeholders play significant roles in shaping the use of coastal resources.

Faced with the shrinking of their fishing grounds, fishers and their representatives have actively engaged with national authorities to find acceptable compromises through **maritime spatial planning** agreements. This has helped to reduce conflicts between the various coastal actors. Resource-sharing issues still exist and are usually resolved in each Member State, often through regional-level dialogue. This localised approach allows for more tailored solutions that consider the specific needs and conditions of each region.

The strong emphasis on technology, food safety and sustainable fishing has made **education and skills development** crucial components of the fishing profession. Fishers often require retraining to adapt to new technologies and sustainable methods, ensuring they can meet the evolving technological requirements of the industry. The consolidation of fleets has required fishers to develop adaptable skills enabling them to transition between vessels with potentially different gear, technology, and fishing practices. Training programmes also emphasise business skills in effective marketing, sales strategies, regulatory requirements and financial management, preparing fishers to navigate the modern marketplace with confidence and digital know-how.

The net result of these anticipated changes in the status of the planetary crisis is that fish stocks within this scenario are anticipated to be moderately stable.

Key driver 2: Demand for EU-caught fish is high

The **high demand for EU-caught fish** stems from multiple reasons.

Prices for fish remain reasonable thanks to relatively stable fish stocks and the curbing of **operational costs** for vessels. The need to implement technological upgrades, including for the energy transition, and maintain education and training, has placed a burden on those who remain in the industry. But costs are managed by EU vessels thanks to a combination of supporting factors. Improved EU/national subsidies/schemes for energy transition costs and technological upgrades make a significant contribution. And there are cost reductions from some sources, for example, the energy transition to more sustainable fuel sources and AI optimisation of fuel efficiency has reduced fuel expenses for fishers.

Within an overall setting of reasonable prices, many consumers choose to focus on food safety and prefer **locally caught or domestic products,** as well as sustainable products. These combined factors ensure a steady demand for EU vessels' quality fish products.

In a world where unprecedented **international cooperation** has resulted in the mitigation of the triple planetary crisis, and consequently stable fish stocks and reasonable prices, many EU citizens and consumers can afford to focus on the quality, sustainability and ethical sourcing of their fish products. EU rules on food safety, environmental and social sustainability, for both EU-produced and imported fishery and aquaculture products have evolved to meet this demand. EU fishers have also adopted or reinforced practices in line with these consumer requirements, motivating others to do the same.

Consumers also value **transparency and traceability**, demanding detailed information about the origins, quality and sustainability of their seafood. This has led to the widespread adoption of public and private labelling and certification schemes, including through the use of blockchain technology, for sourcing and production. In addition, preferences for "home-caught" i.e., nationally native fish, persist – in part due to nationalism but also because of the trade rules applied to non-EU catches that do not adhere to the same food safety and sustainability standards.

Many countries have been working to improve the environmental sustainability and quality of their own products in the context of the planetary crisis: some have reached EU standards, but many are still falling short. This balance may change in the coming years, but currently, many **imports** are still at a disadvantage when it comes to food safety and sustainability standards. Trade rules on non-EU fish not respecting these same standards are introduced. On the one hand, this has created a level-playing field for the industry, effectively managing unfair competition. On the other hand, this has maintained a flow of quality imports, thus contributing to satisfying EU demand on an equal footing with EU fleets and limiting price increases.

The net result of the anticipated stability in fish stocks and prices is that demand within this scenario will remain high and that consumers will be keen to support EU-fishers by choosing locally-sourced fish that adheres to EU standards of quality, sustainability and ethics.

What does this combination of drivers mean for the industry?

Existing specialisation among different fleet segments has become further pronounced. Small-scale fleets with a more local focus have gained a **competitive advantage** as they can better meet consumer demands for sustainable, traceable, and locally sourced seafood. Their proximity to coastal

communities and direct engagement with consumers enables them to build trust and offer a personalised experience, capitalising on the growing preference for locally-caught fish and the transparency offered by shorter, more traceable supply chains. Large-scale fleets continue to play a vital role in ensuring **food security** within the EU, having successfully leveraged their resources to implement robust sustainability and traceability measures across their complex supply chains.

Since 2040, the EU has intensified its support for integrating *advanced technologies* into its fishing fleet, promoting the adoption of new cutting-edge vessels and equipment, and making fishing more efficient. This shift has attracted new investors into the industry, fostering innovation and modernisation.

Significant **public and private investments** have gone into the transition to carbon-neutral engines. This includes national-level loans for equipment upgrades, as well as public-sector initiatives that provide the infrastructure for zero-carbon fuel adoption. The introduction of new technologies, such as better-selective gear, enables fishers to meet increasing legal requirements on sustainability while answering consumer demand more cost-effectively. Private sector investment has also helped improve the availability of modern infrastructure in ports and processing facilities, further supporting the integration of these advanced technologies.

Advanced AI systems play a crucial role in ensuring quality, sustainability and traceability. They help to maintain compliance with stringent standards, leveraged extensively by large-scale fleets that have the financial capacity to do so. These systems provide high predictability of fish stocks, allowing for more proactive and informed management of fisheries resources. This predictability supports more stable income streams, as fishers and investors in the sector can better anticipate stock levels and market demands.

Despite many young people migrating to larger urban areas for employment opportunities, the fishing industry's increased investments in health and safety conditions and compliance with quality and sustainability requirements have improved the **social image of fishers** and attracted a new generation of workers from both inside and outside the EU. This change in **working conditions** and reputation has not only enticed more young people but has also drawn more women into the workforce, contributing to the industry's diversification and ensuring the continued **attraction of new recruits**. While playing a crucial role in ensuring food security and meeting the growing demand for EU-caught fish, fishers' participation in the stewardship of the seas is increasingly recognised, along with its positive impact on the lives of EU citizens and the environment.

The EU has also invested in specialised **training programmes** that equip existing and aspiring fishers with the skills needed to operate advanced technologies and navigate the complexities of sustainable fishing practices. Scholarships and apprenticeships are making these programs more accessible,

while mentorship initiatives connect experienced fishers with new entrants, fostering a sense of community and knowledge transfer.

Thought starters for Scenario 1 – Thriving Responsibly

The scenario raises the following points:

- How can fishers effectively balance the adoption of new, sustainable fishing technologies while preserving traditional fishing practices and the cultural heritage of the sector?
- How can the fishing industry capitalise on its current appeal (as described in this scenario) and attract young people, ensuring a continuous influx of new talent, including more women?
- How can fishers be supported further to produce sustainable, high-value fish products demanded by EU consumers?
- How can maritime spatial planning processes be further refined to ensure fair and transparent allocation of coastal resources, balancing the needs of the fishing industry with those of renewable energy, aquaculture, and tourism?
- What mechanisms could be considered to further encourage fishers to actively contribute to conservation efforts, for example, for stewardship of marine resources?
- How can the EU maintain its position as a global leader in sustainable fisheries management, influencing international standards and practices to ensure the long-term health of the world's oceans?
- In a future where there is limited climate change and high consumer demand for fish with some consolidation of fleets, how can fishers retain control over the sector against outside interests?

Profiles of future fishers in 2050 under Scenario 1 (Thriving Responsibly)

Under Scenario 1, we envisage the following profiles (and personas) for small- and large-scale fishers. These outline key fisher characteristics which are intended to be illustrative but plausible of future fishers under this scenario.

Small-scale fisher

Modernisation with respect for tradition

Situation

The most negative impacts on small-scale fishers of climate change, ecosystem degradation and pollution have been contained, though challenges remain. There have been some minor changes in fish species distribution and availability, but **day trips within 12 nautical miles are still typical** for the small-scale fisher owning or working on under 12m vessels as they have been for decades, and catches have remained relatively stable. Increases in offshore windfarms and wave energy infrastructure, coupled with expanded marine protected areas, which have contributed to moderating the planetary crisis, have however reduced the inshore coastal areas that the small-scale fisher can access. The number of small-scale fishers in the EU fleet in 2050 is fewer than it was in 2025 due to increased efficiencies in the fleet (which have reduced the need for labour and also meant that fewer vessels have been necessary as part of the fleet's renewal over time), and less interest by fishers to continue fishing due to restrictions and regulations. However, thanks to limited global temperatures rises and good stock management, coupled with a positive market situation, **the numbers of small-scale fishers in the EU are only slightly down compared to those of 2025**.

Governance

For the small-scale fisher, **fishing is generally their main economic activity**, largely thanks to the policy provisions and support that have enabled adaption and evolution. Collective efforts and agreements supporting sustainable management and cooperation in ocean governance, for example through maritime spatial planning, have resulted in the **enhanced inclusion of the small-scale fisher's interests in the localised approaches to fisheries management** which have become standard. In this process, the small-scale **fisher has become one of the EU's many key partners ('interlocutors')**, and both parties endorse their respective responsibilities and duties: promotion of rules by the EU, and compliance and a transition to carbon neutrality by the small-scale fisher. **Paying for vessel improvements and modernisation has been challenging** to support not just a green transition, but also the introduction of improved technologies as part of vessel upgrading. It has required investments from public sources, as well as by fishers and other innovative private sector sources, but such funding has been made available because of optimism over the sector's long-term prospects.

Working environment and recruitment

Onboard the fisher's small-scale vessel, exposure to the elements has slightly worsened due to the greater unpredictability in the weather, but automation and more targeted trips mean **more pleasure in the job** because it **is less**

demanding physically than in the past. Initiatives (many technology-driven) to improve safety have also been introduced, although conversely more automation onboard means some small-scale fishers are increasingly able to fish single-handedly, which can increase safety risks. The small-scale fisher is however, on balance, more **satisfied with working conditions** than two decades ago. A positive change in the image and appeal of the profession over time has **contributed to a small but steady flow of new entrants**, including more women, contributing to its rejuvenation and replacement of labour as older fishers retire.

Skills

The small-scale fisher is **better educated and trained** than in the past, often having completed higher education to complement vocational fishing training. Harmonised training schemes across Europe have been promoted, supporting the ability of fishers to seek work in other countries should they wish, and the availability more generally of training schemes has helped attract labour from outside of traditional fishing families. This has meant that the small-scale fisher comes from a greater diversity of backgrounds than before, and that fishing is less reliant on skills being passed down from one generation to the next. The small-scale fisher generally has a **high level of technical competence to comply with management, safety, and catching requirements**. Greater levels of education and training than in the past, although not ubiquitous, also mean that the small-scale fisher has the skills to negotiate and assert rights in discussions with other competing blue economy sectors.

Technology and innovation

The small-scale fisher has embraced improvements in Information Technology (IT) and AI. Such improvements help with the marketing of catches, have contributed to increased vessel efficiencies and fishing selectivity, and aid with reporting and control requirements. However, making technological upgrades has been challenging for many small-scale fishers given the costs, and not all have made this shift towards new technologies. The result is a technological divide between those fishers who have modernised and those who have not.

Aware that better data results in better decision-making, the small-scale fisher is a **steady contributor to research** and to real-time fisheries management and monitoring. Despite the costs, many fishers have generally **embraced progress and modernisation**, and support for sustainability is an important driver in choosing a career in fishing along with other factors, such as living and working locally, autonomous working practices, and the maintenance of coastal values and heritage.

Selling to consumers

The small-scale fisher has established a more **direct relationship with consumers based on EU-wide traceability**, providing high-quality certified fish, although marketing organisations remain important. **Digitalisation and social media are essential tools** in promoting some of the small-scale fisher's catch to consumers (but are challenging to keep on top of when coupled with the workload from fishing), and for sharing information about fishing practices and trips with the public. Much of the small-scale fisher's catch is however still sold through traditional marketing channels such as auction markets or fish traders. The high-value species targeted, and the fishing methods used, have generated market advantages in the supply of specialised products, often with a defined geographical origin. With improvements in first sale systems, **many sales are local** or through short value chains, and traceability from the fisher to the consumer, accompanied with certification to meet environmental standards, has become central to fish marketing and guaranteeing incomes and reasonable pay. The climate-proofing and upgrading of **landing sites which double-up as marketing hubs** have boosted the local distribution of quality fish, as well as the small-scale fisher's income. The strong local geographical concentration of upstream and downstream businesses with which the fisher is linked through purchases of inputs and sales of catches, generates hubs of fisheries sector activity that benefit the small-scale fisher's operations. Together with the knowledge that there is protection from the threat of cheap uncertified seafood imports thanks to EU trade rules, **the fisher has cautious confidence in the sector's long-term viability and has managed to balance modernisation with respect for tradition and heritage**.

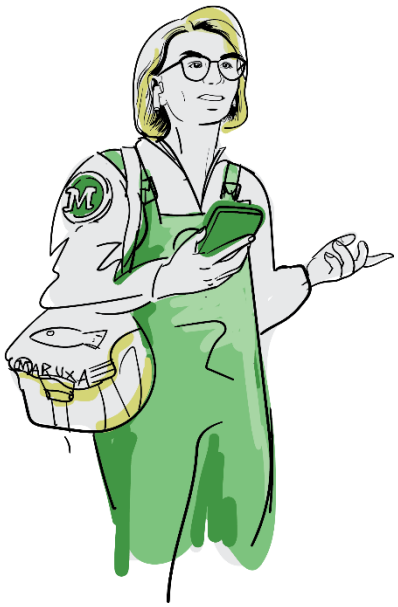
Personas

Paulo (man, 50, owner, polyvalent gear, Azores / Outermost Region waters (Portugal), advanced fishing qualification)

Paulo grew up near the sea. He developed his fishing skills when he was a teenager and decided he wanted to pursue a career in fishing. To this end, he undertook an advanced course in fishing, which broadened his knowledge of marine conservation, fisheries management, and legislation. Now 50, he owns a 10m boat. While his fishing methods have remained polyvalent (using different gears, and targeting more than one species), installing smart technologies, remote sensing and now AI onboard his boat enabled him to adjust to the seasonal shifts in species, avoid by-catch and comply with high food safety standards. It has also given an edge to the marketing and promotion of his catches (the demand for which can also be quite seasonal), thanks to his direct connections with buyers and the capacity to respond in real-time to the demand from his network of high-end restaurants and outlets where fish quality,

traceability and sustainability command premiums. Protection of the coastal and marine environment is also a concern for him. He feels positive about the contribution he's making to the sector and his community, and proud of his connections with the broader public and others within the industry. He also appreciates the safe operating environment that regulations have created for small-scale fishers like him, which, together with the containment of climate change impacts and steady demand for fish products, give him personal and economic rewards and the confidence to plan for the continued development of his business. All these things have resulted in notable improvements in his mental well-being and self-esteem in recent years. "*Keeping abreast of technological innovation was a no-brainer and has taken the benefits I get from a job I love to new heights.*"

Maruxa (woman, 40, fixed gear/pots, Bay of Biscay and the Iberian Coast (Spain), double diploma in fishing technology and another -non-fisheries specific- subject)



Maruxa has lived all her life in a small coastal community with a strong fishing tradition, and she was brought up with fisheries activities all around her. She is glad that curbing climate change and maintaining sustainable environmental conditions enabled her to enter the sector, even though strict regulations place constraints on her activities. She is one of an increasing number of women who have entered the sector in recent years, relying on both traditional and new knowledge to adapt to new realities. She fishes part-time for prawns, crabs and other high value species, and this is her only income-generating activity. Local demand for her catch and its high price makes her activity worthwhile – some of her products can be sold directly to local restaurants at a premium, with the rest fetching good prices in local auction and retail markets. Much of the demand for her fish is fuelled by a strong national tradition of consuming seafood, along with demand from tourists often associated with the folklore of fishing. She knows the link with tourism and heritage is important. She is keen for the wider public to appreciate what she does and the special place that she and her activity occupy in the landscape and community – characteristics that are recognised, along with quality, by the certification scheme that her fish and shellfish comply with. She is hoping she will pass on her skills and love of this activity to her children and sees a future in the sector as sustainable. "*Fishing runs in my blood and I am proud to play a role in the recognition of women in the profession.*"

Large-scale fisher

Fishing for profits in a digital age

Situation

Temperatures have risen in comparison to historical levels and some more extreme events due to climate change do occur, but they have been adapted to. There have been only moderate changes in fish species distribution and availability due to climate change affecting the large-scale fisher. Ecosystem degradation and marine pollution have also been addressed and reversed compared to earlier years, based on several decades of efforts. Although in many places the total number of large-scale fishers owning or working on vessels over 12 metres has decreased following a **consolidation of fleets and concentration of ownership,** which has been a long-term trend in the sector, access by the large-scale fisher to fishing grounds in non-EU waters has been maintained and interests protected under fishing agreements with neighbouring coastal States and other third countries. Coupled with improved management of stocks in EU waters this has ensured some **stability in catches**. The EU's active participation in international fora on cooperation and fisheries governance, and its facilitating role in the harmonisation of relations with other fishing nations, mean that the **large-scale fisher's interests are recognised in non-EU waters**. The large-scale fisher faces **fewer tensions than in the past with other users of the marine environment** in the EU thanks to improved maritime spatial planning.

Science and modernisation

The large-scale fisher **embraces the restoration of fish stocks and marine ecosystems** and works collaboratively with the EU and regionally devolved fisheries management arrangements to ensure that catches align with scientific advice. Scientific advice has become more comprehensive and informs fisheries management more reliably than in the past, in part due to the use of technology and digital tools in fish stock assessments and **better data that the large-scale fisher also collects for research**. The large-scale fisher has good **confidence in science and the consultative processes** for legislative change. For the large-scale fisher, **investments to modernise vessels and fishing and marketing methods have not been easy** when relying solely on their own financial resources. The fisher has **often, but not always, benefited from much-needed financial support** provided through a wide variety of financing mechanisms which have enabled a shift to less polluting engines. This energy transition is also contributing to increased efficiencies given the large share that fuel costs make to total operating/trip costs. The **installation of necessary IT, digital tools, and real-time and AI-guided technologies have also come at a cost.** But such developments have resulted in more efficient and selective fishing, in improved marketing practices, and have contributed to reducing the administrative burden of complying with regulations.

Education and prospects

The large-scale fisher generally has more **formal education and/or training** than in the past or has had to retrain, whether onboard or onshore. Positions onboard are fewer following **robotisation and automation of deck and processing activities**. However, stable prospects for the fishing profession under this scenario, coupled with improved working and safety conditions, are attracting a small but steady number of new EU and non-EU recruits as **fishers see a career in fishing and long-term potential for advancement**. This considerably eases the recruitment headaches that the large-scale fisher owner used to face two decades ago in some fleet segments.

Engagement with buyers

Access to defined markets, EU support for a level playing field with imports, and a degree of preference by consumers for national products, all benefit the large-scale fisher. Also positive is the use of **digital technology** which enables the fisher, and organisations involved with planning and marketing catches, to engage with buyers in real-time about their requirements. Meeting requirements for certified sustainably caught seafood has meant continuously investing in data collection and IT systems that connect the large-scale fisher to marketing chains on land and that can guarantee the **full traceability** of products. The **large-scale fisher has some bargaining power in seafood value chains** when selling catches, although good prices paid by final consumers are not always transmitted through auction markets or sales contracts by processors and traders to the fisher.

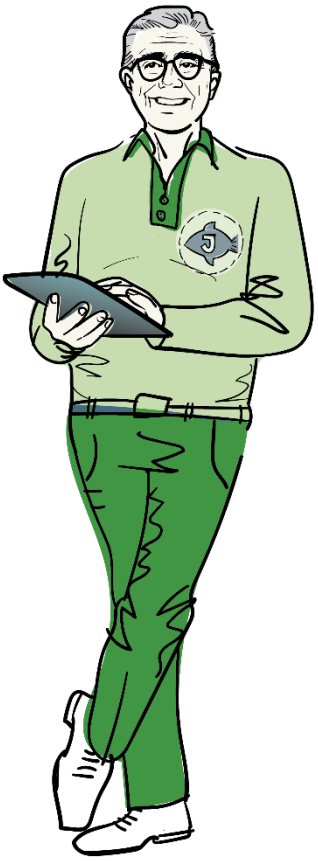
Profits underpinned by technology

The profits from fishing by the large-scale fisher have consolidated through the further concentration of ownership in some large corporations, although many vessels remain individually- or family-owned. Healthy profits have in turn attracted **capital investments from outside the sector**. Reinvestments in vessel modernisation, digitalisation, communication and post-harvest research and development keep the **large-scale fisher at the cutting edge of the fishing business**. IT and AI used when planning and conducting trips contribute to **greater efficiencies at sea** and increased profitability. Social media and targeted use of communication channels enable the large-scale fisher to communicate effectively about the sustainability and social responsibility of the business.

Personas

Jeroen (man, 60, corporate shore-based owner/manager, pelagic vessel, North Atlantic/Oceanic Northeast Atlantic (Holland), degree in management)

Jeroen comes from and lives in a coastal city where the offices of the pelagic fleet of vessels his company manages are located. He has spent most of his career in this company, starting with a couple of years working at sea to familiarise himself with the profession. His role is now chiefly office-based, managerial and strategic in nature as he deals more with investors, buyers and legislators than with fish. He has witnessed the consolidation of large-scale fleets (some now being controlled by those in other countries), following heavy investments in carbon-neutral propulsion to comply with commitments towards net zero. He was visionary in promoting the uptake of IT, real-time data systems and AI-guided technologies onboard all company vessels when these innovations were emerging and reaped the benefits of bringing his fishing company into the digital age early. He recognises that this evolution was not easy for all his peers, especially the older generation of captains and owners for whom upskilling has been a challenge. For him, profitability, productivity and protection of marine ecosystems go together. Improvements in the selectivity of fishing practices to catch small pelagic species, such as mackerel and herring, and traceability and compliance with the demand for sustainably caught fish, coupled with efficient communication, have provided a comparative advantage to his business. He is happy that access to distant water fishing grounds has been preserved under EU and direct access agreements. He is pleased with his contribution to sustainable fisheries, carbon neutrality and the supply of high quality, competitive fish products, and is confident that his company's profitability will be maintained in the long run. "*Large companies such as ours are essential for the long-term viability of fisheries in the EU. We balance environmental sustainability with economic efficiency, and provide what consumers want.*"

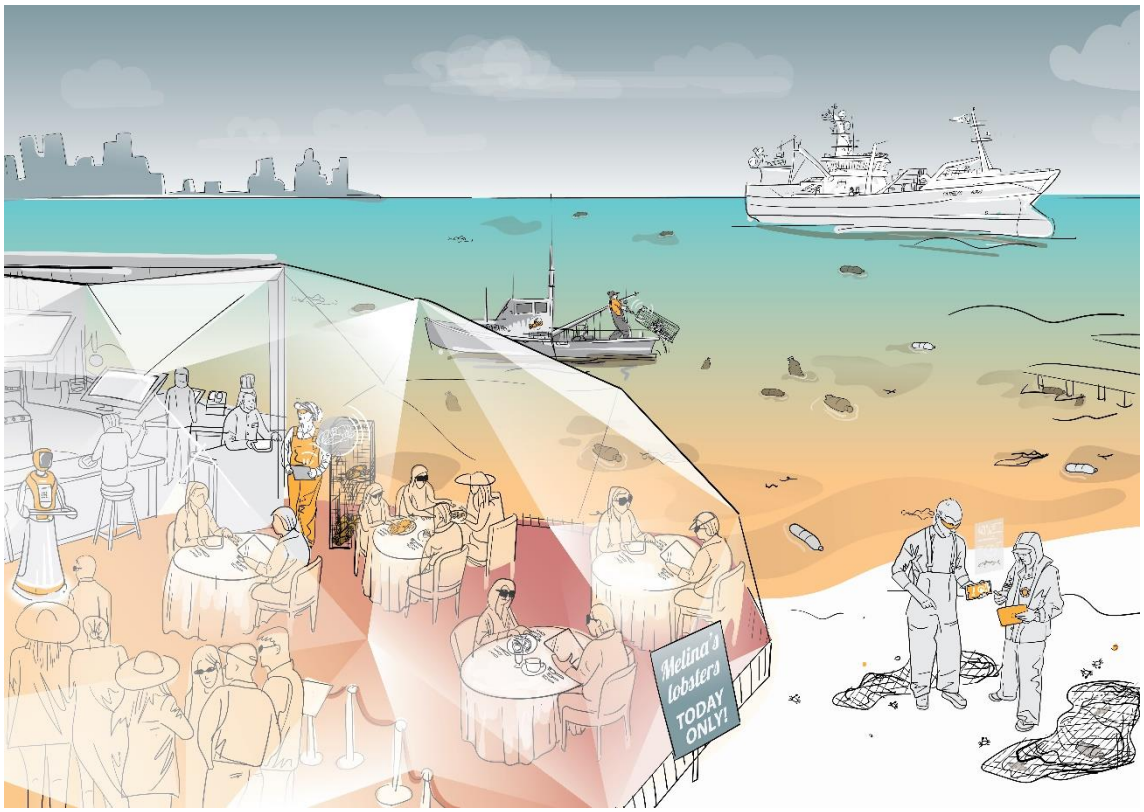


Aiden (man, 25, crew, Atlantic/Celtic Sea (Ireland), high school diploma)

Aiden works as crew onboard a large fishing vessel targeting small pelagic species in the Atlantic and the Celtic Sea. He earns well with an incentivised salary for a large company that owns several vessels, and he feels lucky to have a job at sea. He thinks his work is a young man's job and he is happy to do it, although he is aware of the dangers of fishing despite safety improvements onboard in recent years. The working conditions are fine for him, and he enjoys

the camaraderie and being involved in both catching and processing fish onboard. His training and education were helpful for him in securing a crewing position and he had to demonstrate he could learn quickly about all the advanced technologies and automated processes. “*The job is a good way for me to earn and save some money so I can start a family with some financial security*”.

Scenario 2: Chasing Declining Stocks



Snapshot

In 2050, fishers and consumers face significant challenges as global temperatures very severely exceed pre-industrial levels, exacerbating climate impacts on ocean and coastal ecosystems. Marine heatwaves and exceptional climatic events have intensified, leading to coastal erosion, sea level rise, habitat loss, and changes in water chemistry and catch composition. This has required the EU to further reduce quotas and other fishing opportunities, resulting in increased conflicts between Member States and with neighbouring countries over scarce resources. The decrease in available fish is significant but the market demand for EU-caught fish is still high, as EU products still provide more guarantees of quality and sustainability than non-EU products, for those who can afford it. Elevated prices for quality and sustainably sourced fish have segmented the market, pushing price-sensitive consumers towards alternative proteins or non-EU products, regardless of food safety or sustainability.

Key drivers in this scenario

Scenario 2 – Chasing Declining Stocks: Primary drivers of change

- A **severe planetary crisis** where worldwide efforts have been both insufficient and poorly, or unevenly applied so that climatic changes, pollution levels and biodiversity loss have severely depleted fish stocks.
- **Demand for EU-caught fish is high**, primarily due to consumer confidence in EU sustainability standards.

Scenario 2 – Chasing Declining Stocks: Secondary drivers of change

- **Geopolitical landscape,** potential for conflicts and disputes over sovereignty and access to marine resources increase as a result of severe environmental crisis that exacerbates challenges linked to security.
- **Interactions and conflicts with coastal communities** and other coastal users continue to be a challenge.
- **New technologies, in the form of AI, new devices and software** have not been as widely adopted as hoped because depleted stocks have made the financial case for investing in them harder to justify amongst entrepreneurs and tech startups. The costs have led to a technological divide.
- **Scientific data** is largely focused on understanding changing stocks dynamics and availability.
- **Vessel costs (investment and upkeep)** have risen, in some limited cases for those who have transitioned to new energies and technologies, but mostly, for all those who have not, to pay for severe increase in fuel prices. The amount of fuel used has also increased due to extreme weather events forcing fishers to go further or for longer periods of time.
- **Funding sources** continue to impact the sector with public funding being more limited but the small remaining demand for EU-caught fish creates conditions for a limited number of vessels to secure investment or grants.
- **Fisher demographics and recruitment** issues continue to challenge the industry, with uncertain financial returns and extreme weather conditions discouraging young people from taking up this way of life.
- **The nature of work in the fishing industry** has evolved, creating a divide between those who have acquired new education and skills to work on the boats that have made the transition to sustainable practices and new technologies, and those who continue to rely on superseded skills and practices.
- **Fishing regulations and governance** still focus on food safety, fisher welfare and sustainability, but implementation has been weak or fragmentary.

How did we get here?

This timeline provides a general overview of the key events and issues that could lead to Scenario 2: Chasing Declining Stocks in 2050.

2025-2030	2030-2035	2035-2040	2040-2050
• Marine heatwaves and extreme weather events become more frequent and severe. • International agreements aim to limit global warming to moderate levels above pre-industrial temperatures, but progress is slow due to disagreements between countries.	• Coastal erosion and habitat loss accelerate, displacing communities and affecting fisheries. • Consumers still demand seafood, but affordability concerns lead to a rise in alternative protein sources. • Development of new fishing gear, vessel designs (including utilising low-carbon fuel), and monitoring systems to adapt to changing conditions. These are only adopted by the few vessels who can afford it. • Marine aquaculture farms develop, including offshore in combination with the development of Offshore Renewable Energy (offshore wind farms).	• Lower quotas and stricter fishing restrictions are implemented because of decreasing stocks. • Global temperatures have significantly exceeded pre-industrial levels for several consecutive years. • The development of AI-powered monitoring systems, autonomous vessels, and advanced fishing gear slows down as there are fewer fishing vessels to take them up.	• The EU market's self-sufficiency rate for fishery products further decreases, as imports increase to meet market demand. • Fishing grounds and catch limits are further reduced. • A major marine heatwave disrupts ecosystems in multiple regions and seas. • The North Atlantic current reaches a tipping point, potentially causing permanent changes in ocean circulation patterns, with other ocean currents showing signs of similar vulnerability.

Scenario narrative

Key driver 1: The impact of the planetary crisis is severe

In 2050, fishers, consumers, and European societies as a whole face a difficult world as global temperatures have very severely exceeded pre-industrial levels. **Climate impacts** on ocean and coastal ecosystems have been exacerbated by increases in intensity, reoccurrence and duration of marine heatwaves and other exceptional climatic events. Due to these impacts, the rate of sea level rise has

recently exceeded the adaptation capacity of vulnerable ecosystems, such as small islands, low-lying coastal areas, and deltas. This has led to coastal erosion and loss of coastal habitat and marine ecosystems. In addition, a lack of co-ordinated policies across territories have led to pollution levels with EU waters having increased drastically, further compromising the lifecycles, lifespans and ranges of affected marine species.

The **catch composition** of species has changed, in the Atlantic, the distribution of northern species has contracted due to an overall northward shift of their northern and southern boundaries. In contrast, southern fish species have expanded their range northward while still maintaining some presence in the southern parts of their original habitats. In the Mediterranean Sea, some species have attempted to move to deeper, colder waters but face limited suitable habitats. Additionally, some tropical species have migrated to EU waters, which has altered ecosystem dynamics. Exploitable biomass of commercial stocks has become more difficult to predict in all sea basins due to ecosystem changes. Small pelagic species are being more impacted but recovering more quickly due to their ability to track suitable thermal conditions compared to demersal species, which are more constrained in their adaptation capacities.

The changing environment has led to debates on how to adapt and implement the **rules governing quota allocation** between the EU Member States, including the principle of relative stability and the way in which quota swaps and quota flexibility (between years and species) are used. However, no conclusive solutions have been reached.

The net result of these anticipated changes in the status of the planetary crisis is that fish stocks within this scenario are anticipated to have decreased significantly leading to an imbalance between supply and demand.

Key driver 2: Demand for EU-caught fish is higher than supply

Elevated prices due to falling supply have created a more **segmented market** where only certain demographics, such as higher-income families and some older generations, can afford these premium products. These high-end consumers rely on EU products providing better guarantees of food safety and sustainability. Price-sensitive consumers turn to cheaper non-EU fish, regardless of quality or sustainability, while others choose alternative sources of proteins, such as cell-based proteins of aquatic animals, plant-based fish or diets, which are more affordable.

Decreased catch limits within the EU, designed to ensure the long-term resilience fish stocks, have led to **a greater reliance on imports**. However, this demand coincides with a global shift in fishing patterns. Non-EU countries, witnessing the

impacts of climate change on their own waters, are becoming more strategic, focusing on different species that have become more abundant in their regions and prioritising the needs of their domestic markets. As a result, agreements on access to the waters of third countries are harder to reach and conflicts are rising within Regional Fisheries Management Organisations (RFMOs) on access to fishing opportunities, putting the profitability of the EU's large-scale and distant water fleet at risk.

With continued demand for fish, **competition for coastal resources** has persisted since the 2020s. Although the energy transition has not been as significant as foreseen, competing marine activities are sufficient to exacerbate the reduction in catches due to climate change, biodiversity loss and pollution. To try to minimise conflict within Member States and with other sectors over the use of marine space, attempts have been made to improve collaboration on maritime spatial planning agreements. However, fishers continue to face challenges in finding their place within this new seascape due to their decreasing economic weight.

The net result of the anticipated changes within this scenario is that the demand for fish has been segmented between high demand for EU-caught sustainable fish, and consumers with lesser means that turn to non-EU fish or alternative proteins. Even with the rise of EU fish prices, fishers will struggle. The industry will support fewer vessels and those that survive will have to further go afield, for longer periods to find fish.

What does this combination of drivers mean for the industry?

The **costs of vessel adaptations** to move away from fossil fuels have significantly strained vessel profitability. The difficulty in transforming fishing vessels to be more energy-efficient has posed significant challenges for the large-scale fleet, using active gears and with older vessels, as well as for the small-scale fleet, where space for new technology is limited. As a result, the energy transition within the EU fishing industry has been limited. Access to fisheries is granted with careful consideration of GHG emission criteria, leading to the loss of some fleet segments that were unable to transition to carbon neutrality.

To reduce running costs in the medium and long term, there has been a focus on more **innovative fishing** gear, hull design, and the use of digital optimisation tools for fishers who can afford to do so. Large-scale distant water fleets have become more automated, but the reliance on automated systems has also increased training requirements beyond traditional fishing knowledge. This has introduced a widening **technological divide** between fishers who can adapt to new technologies and those who cannot. The uneven rollout of high-speed internet to smaller ports exacerbates this divide, leaving many fishers ill-equipped to utilise digital tools and platforms.

New technologies have facilitated the expansion of **marine aquaculture** (including offshore), which aims to increase the overall supply of fish and reduce pressure on wild fish stocks. While offshore aquaculture presents a potential alternative avenue for some fishers to diversify their activities, transferable skills and the willingness of fishers to diversity into the sector are limited. Aquaculture also has its own set of challenges, including the impacts of climate change. The EU faces the complex task of fostering sustainable growth and innovation in aquaculture, while mitigating its potential risks to ensure its long-term viability as a complementary food source and activity.

Public funding of the fishing sector, including national and EU support, has sparked strong debates within the international community, because of competing economic priorities. Without solid support from all public actors, funding has been insufficient to offset the costs of all actors in the sector. This has led to a consolidation of the fishing fleet to face required costs and investments.

Efforts made in the last decades to improve **working conditions** and ensure **equal opportunities** in terms of rights, mutual recognition of roles, and the promotion and integration of women have had limited impact on the sector, whose priority is to cover costs and ensure profitability. The reduction of vessels and extreme weather conditions affecting safety onboard has reduced the number of EU fishers. As a remedy, vessel owners have resorted to using more non-EU labour who work alongside a small number of EU fishers that have chosen to stay in the sector.

Younger people in 2050 generally have different **perspectives on 'work',** being less inclined to spend long periods away from home and preferring to engage in various types of jobs throughout their lifetime, often preferring urban-based careers in more stable industries that are not facing such acute climate-related challenges. Despite significant difficulties in recruitment, remaining fishers are still advancing the sector, leveraging robotics and new roles on board, although these demand higher education and new skills.

The use of autonomous vessels controlled from shore is increasing in a limited manner, helping some fishers adapt to increasingly volatile conditions at sea to continue to meet high demand as well as reducing running costs. This **new technology** proves difficult for the ageing workforce to adapt to, but some elements of automation also help to reduce the physical toll of fishing on older fishers, helping to keep them engaged in the sector for longer. However, concerns remain about job displacement in coastal communities already grappling with the impacts of climate change. EU large-scale fleets are the main adopters of this technology due to their greater financial capacity to pay for the significant upfront investment. These advancements help them contribute to protecting the food security of the EU amidst extreme climate change impacts.

Illegal, unreported and unregulated (IUU) fishing has become increasingly prevalent, due to resource scarcity and strong market demand. To tackle this, the **use of AI** is increased to analyse data from **monitoring systems** to identify suspicious activities. Real-time data allows for proactive measures and real-time assessment of fish stocks through innovative methods. Increased co-management schemes reinforce fishers' confidence and willingness to participate in data collection. These monitoring systems also help to ensure that the correct information about the products is transmitted along the supply chain, allowing for correct labelling information for sustainability-conscious consumers.

Thought starters for Scenario 2 - Chasing Declining Stocks

The scenario raises the following points:

- Given the significant changes in fish stocks and distribution, how can fishers best adapt their fishing techniques and target species to maintain viable livelihoods?
- What specific skills and knowledge will fishers need in a future dominated by automation, robotics, and AI-driven fishing technologies?
- How can the fishing industry increase its' attractiveness to younger generations with different perspectives and aspirations regarding their working life?
- What new forms of international cooperation and agreements are needed to manage shared fish stocks effectively as species migrate across national boundaries?
- How can EU-caught fish be made more accessible to lower-income families, given its high demand and current climate change-induced market dynamics that favour higher-income consumers?

As aquaculture advances, what kinds of measures can be taken to adapt this activity to the impact of climate change on the industry to ensure aquaculture can be a viable solution to support food security along with traditional fishing?

Profiles of future fishers in 2050 under Scenario 2 (Chasing Declining Stocks)

In Scenario 2, we anticipate the following set of profiles (and personas) representing small- and large-scale fishers. These profiles highlight essential characteristics that aim to provide a realistic and illustrative depiction of future fishers within this scenario.

Small-scale fisher

Hanging on in a challenging environment

Situation

Important changes in catch levels, composition and distribution, brought about by climate change, ecosystem damage and pollution, have meant significant **changes in the small-scale fisher's operations and catches** in recent decades: different fishing grounds have had to be explored, and **new and adapted gear has been introduced** in efforts to catch declining supplies of traditional species, and some new species which are now to be found. Together with levels of fish stocks that are significantly lower than in 2025 and which are accompanied by increasingly smaller quotas, the small-scale fisher's **catches are much lower than in 2025**. Coupled with a failure to fully shift to fuel efficient engines and ever-rising other operating costs, the **costs per tonne of fish landed have increased** significantly. The poor state of the marine environment and extreme climate change have had a big impact on profitability for many fishers despite strong market demand in 2050. **Small-scale vessel numbers are down compared to 2025, with an associated and significant decline in the number of small-scale fishers compared to 2025.**

Working conditions and infrastructures

Unpredictable seas and weather make fishing and **working conditions perilous** for the small-scale fisher. With a small vessel, the increased unpredictability of the weather means that it is not possible for the fisher to go to sea as frequently as in previous decades, which reduces catches. Much of the shore-based infrastructure and facilities on which the small-scale fisher relies, are often damaged or unusable for periods of time, notably because of more violent weather events (floods, storms). **Many fishing ports used by small-scale vessels are closer to being museums or heritage sites than active fishing ports** but serve to keep the folklore of fishing alive and provide marketing outlets for the small-scale fisher's landings.

Financing and fishing costs

Competition from other sectors for public budget to support the EU's transition to **carbon neutrality** has been fierce, meaning **funds for the fisheries sector were not sufficient to benefit all small-scale fishers**. Many of the small-scale fishers who were not knowledgeable/trained enough to leverage public funds for the costly investments required for vessel upgrades to comply with EU initiatives to phase out diesel engines and introduce recyclable materials in fishing gear, **have gone out of business**.

Technology and automation onboard have also come at a significant financial cost for the small-scale fishers that remain. Not all new technologies

are suitable for vessels of small sizes, and not all fishers have been able to make upgrades due to difficulties in accessing funding because of the state of the industry. For those who have, and are on the right side of the **technological divide**, these upgrades have contributed to some innovation in support of sustainable practices and have generated benefits as they **make work less physically demanding,** also reducing to some extent the need for unskilled deckhands.

Recruitment

The **small-scale fisher struggles to attract fishing crew** because of the technical requirements of the job (fishing is now more highly-skilled and less manual than it was in the past), the increased risks at sea due to extreme weather events, and an overall dislike by many young people to enter the sector given the hard lifestyle involved, especially when compared to other alternative employment opportunities onshore. Emigration from coastal areas which are less hospitable than in the past, and continued trends towards urbanisation inland, also contribute to the challenges in finding crew. Some small-scale fishers thus rely on migrant labour, which can be available given increases in migration resulting from the global climate crisis, but which must be trained in the modern technologies used, representing another burden. Where migrant labour cannot be found, the small-scale fisher **often has to operate their vessel single-handedly** compromising on safety despite improved safety protocols and equipment onboard.

Diversification

The small-scale fisher has become increasingly professional in outlook over the years, with higher educational attainment. Nevertheless, the fisher often operates on a **more part-time** basis than in 2025 given the impact of the climate crisis on fish stocks and the weather. This necessitates a greater reliance on, and engagement in, **other income generating activities in the blue economy to supplement income**, sometimes with the need to acquire complementary skills.

Data gathering and representation

The small-scale fisher often **contributes to research** on fish stock dynamics and ecosystem changes resulting from climate change, generally recognising the benefits to be gained from reduced fisheries management uncertainties. Although the small-scale fisher is generally willing to share data collected onboard with scientists, science is not always reliable given the volatile nature of the climate, and changes in quotas and fishing locations are still difficult to rapidly adapt to. The small-scale fisher also recognises the **need to work together with peers to ensure that the interests of small-scale fishers are represented at national and local levels,** given increased conflicts between Member States for quotas, and competition for limited resources and marine and coastal space.

Selling the catch

Due to declining catches and controls over non-sustainable imports of fish to the EU, demand for EU-caught fish is high. This means that **prices for the fishers' catch are generally good**. EU consumers' demand for quality and sustainably caught seafood, along with awareness of the lower carbon footprint of seafood protein compared with, for example, red meat and chicken, also contribute to market demand for the small-scale fisher's catch, despite high fish prices. Being largely reliant on fish stocks close to the fisher's home port or landing site, and unable to follow the geographical shifts in fish stock populations, climate impacts are however hugely challenging for the small-scale fisher. This requires efforts to generate more value from traditional and smaller catch volumes, for example, by preparing fish ready for sale, or seeking markets for some species which have become more available than in the past due to stock migrations.

The small-scale fisher, and the organisations supporting the marketing of catch on their behalf, work hard to capitalise on the story that comes with their fish being locally-sourced and use **creative marketing methods to respond to consumer preferences**. The profits the small-scale fisher makes from the sale of catches are lower than in 2050 due to declining catches. As a consequence, although some demand for EU fish is maintained at high prices, many of the small-scale fishers, especially those who were operating part-time or seasonally in 2025, are giving up fishing altogether. However, for the small-scale fisher with enough motivation, training (including to access funding), technological upgrades, and connections, **demand and prices mean that there is a market niche that can be filled**. With fewer small-scale fishers in the EU fleet competing for scarce fish resources than in 2025, profits for those fishers remaining can be sufficient to stay in business.

Personas

Antoine (man, 35, owner, pots and fixed nets, North Sea (France), university degree in marine biology and technology)

Antoine entered the fishing sector when he was 25, having completed a degree in marine biology. Although not from a fishing family, he grew up in a small coastal community by the North Sea and had always been fascinated by the sea and the fishing industry. He chose to study a combined degree in marine biology and technology, and having completed university, wanted to work as a fisher, rather than in the city like many of his friends do. He is a self-starter entrepreneur, and after studying local demand for seafood products, he prepared a small business plan 10 years ago. The business plan was needed to plan for the future and to attract funds from mixed sources to invest in a state of the art, efficient, and low emission under-12 m vessel, and to equip it with modern technology, remote sensing and data collection systems, plus the fishing gear (pots and fixed nets to

catch lobster and high value demersal species) he wanted to use. He has been using it ever since, making small technology upgrades over the years. Keeping up with new automation and robotic technologies is relentless and challenging given the investments required and the irregular and unpredictable financial returns, but his education helps him understand new technology and how to write and where to get support for good applications for funding that can be accessed through various public and private funding mechanisms at local, national and EU levels. His attachment to the sea is a strong reason for why he continues to fish. *"I love the sea and the marine environment and feel fishers should be contributing to marine science and sustainable ocean management. If I can contribute to the long-term viability of this sector, I will".*

Melina (woman, 40, joint-owner, shellfish, Mediterranean (Italy), high school diploma)

Melina jointly owns a fishing vessel with her husband Alberto. While he is at sea fishing single-handedly with the help of various automated onboard equipment, they keep in touch using real-time data and modern software about what shellfish he is catching. They specialise in lobsters and crabs. Melina is responsible for the sales and the administrative part of running the business and complying with regulations. She has developed a network of trusted buyers in specialist fish restaurants on the coast, and local chefs have come to rely on the quality products she and her husband provide. The restaurants even share information with their customers about Melina and Alberto as a local success story, given the strong demand for locally sourced food. She also manages to sell the rest of the catch to specialised crab processing businesses. However, warming seas and pollution are negatively affecting crustacean populations, and over time their family income has been declining as increased market prices are not always offsetting the reduced catches and there is always a risk of health food scares. However, more tourism with visitors in the winter months, which are warmer now, and year-round opening of fish eateries in the harbour where they land their fish, has helped. *"An emphasis on marketing and responding to consumer needs is necessary to survive in this industry given the state of fish stocks".*

Large-scale fisher

Concentration for survival

Situation

The large-scale fisher, operating large vessels which make **multi-day fishing trips** and which can travel far from their home ports, has, to some extent, been able to adapt fishing location in order to match changes in species distributions brought about by climate warming and associated changes in the marine environment. But **catches have declined overall due to climate change, ecosystem loss and marine pollution**. The large-scale fisher's **access to external waters is challenged** by the difficulties countries face in cooperating to address climate change, and the large-scale fisher has to fight hard to keep the interests of the industry high on the EU's policy agenda. Opportunities to 'follow' the fish, for example further northwards in third-country waters, have declined as a result of an increased emphasis on sovereignty over fish supplies by third countries. The large-scale fisher is thus more confined to EU waters than in the past, and some fleet segments have all-but ceased to exist.

Large-sized vessels on which the large-scale fisher works are better equipped to deal with extreme weather events than small-scale ones, and the large-scale fisher is doing comparatively well compared to small-scale fishers because of greater financial means to make the investments needed to stay ahead. However, bad weather still impacts negatively on the time that vessels can spend fishing at sea. Catches and earnings are lower in real terms compared to 2025, and this has led to some concentration of vessel ownership in the large-scale fleet, although many vessels remain individually owned. For the vessels that remain individually owned, dealing with the administrative and managerial workload from regulations and managing new technology is especially challenging given the time involved alongside full-time fishing. **The number of large-scale vessels fishing in EU and external waters, and of fishers on large-scale vessels, have all declined since 2025**.

Onboard upgrades and consolidation

To remain attractive compared to non-fishing occupations, the large-scale fisher owner has had to **improve working conditions onboard**, upgrade vessels in line with safety and comfort expectations of crew and pay salaries that are competitive with non-fishing sectors onshore. As competition for public funds has stiffened across all economic sectors in an effort (only partly successful) to **transition to carbon neutrality**, the large-scale fisher has struggled for a share of the financial support made available from the EU and Member States to replace old engines with carbon neutral forms of propulsion. Affording the **considerable costs linked to the introduction of ever more sophisticated technology onboard** to help identify fish, and to handle and process catch, has

also been difficult. As not all large-scale vessel owners can access such funding **fishing rights have been consolidated over the years with a concentration of ownership**, and many large-scale fishers work for corporate interests owning multiple vessels, while others remain working for individual vessel owners.

With **automated technologies and improved fishing software onboard** most vessels, the large-scale fisher has necessarily upskilled and can comply with regulations and controls aimed at preserving fish stocks, indirectly playing a key role in fishing surveillance and prevention of illegal fishing activities. These technologies also generate improved data used for real-time stock assessments and other scientific monitoring purposes, making **the large-scale fisher, via collaboration with research institutes, a valuable 'citizen scientist'** who can contribute to a better understanding of the impacts of climate change on fisheries, improved fisheries management, and how to adapt for long-term survival.

Traceability, value chains and processing

The large-scale fisher, and organisations planning and organising the marketing of catches, use new technologies for marketing. With **full and real-time traceability of catches** on almost all vessels (although some fleets still find this challenging) providing a competitive advantage over imports for both fishers and seafood buyers, the large-scale fisher can meet a requirement by consumers to demonstrate responsible and sustainable fishing. Tighter rules requiring all imports to the EU to be sustainable, a level-playing field between EU imports and EU-caught fish, and strong demand for fish as a source of protein given the positive image of captured fish and concerns about land-based protein sources (in terms of animal welfare and their greater contributions to climate change), mean **high prices for fish**. Coupled with the ability to make the necessary investments in advanced processing technologies both onboard and onshore, this has presented opportunities for the large-scale fisher to successfully exploit **market opportunities and be a more dominant supplier in seafood value chains,** although good prices paid by final consumers are not always transmitted through retailers, processors and traders back to the fisher. Market opportunities have included processing of innovative products for human consumption and other non-consumption uses (e.g. aquafeed, pharmaceuticals), for example from jellyfish that have proliferated with the warming of the seas and changing patterns in sea currents, or utilisation of fish waste from processing onboard, which were previously considered to have no market value.

Personas

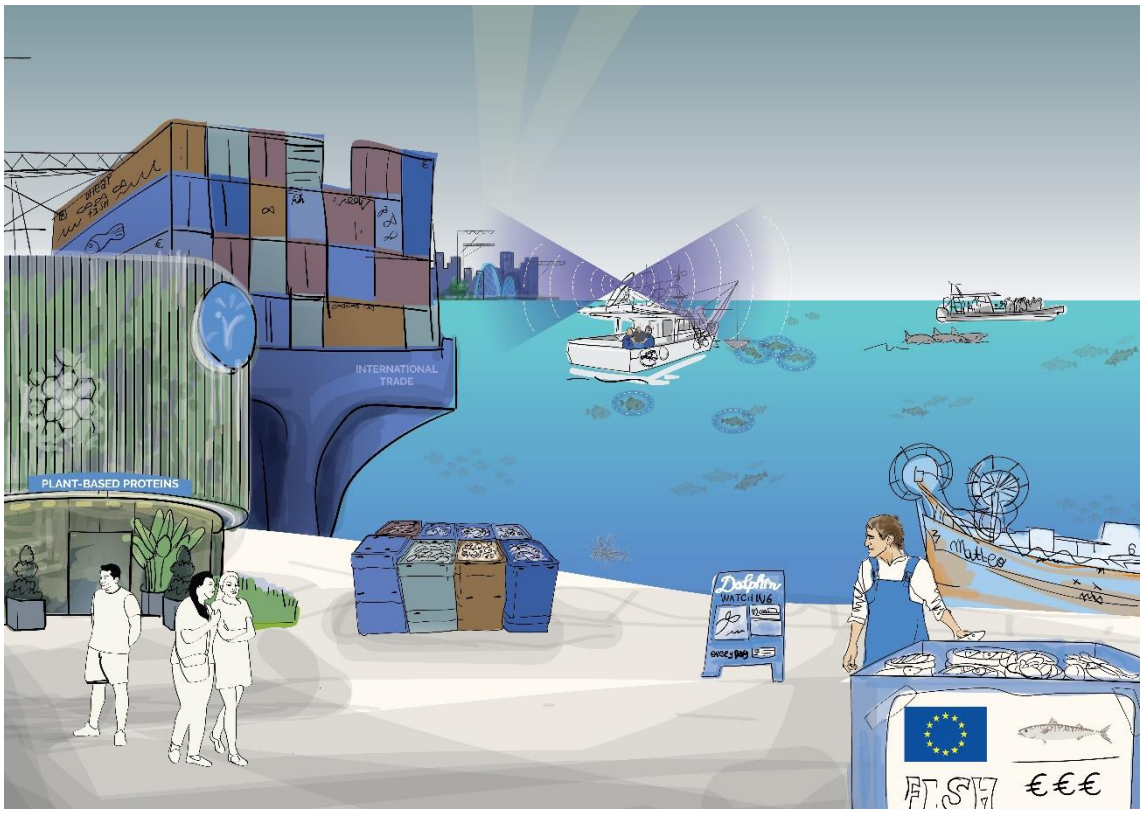
Gunther (man, 45, crew, North Sea and external northern waters (Germany), left school at 18)

Gunther has been fishing for three decades on a large demersal trawl vessel targeting cod and other high value species such as Greenland halibut in EU, Greenlandic, North-East Atlantic Fisheries Commission, and Norwegian waters. He works alongside other EU and non-EU crew. He has seen vessels like the one he works on being scrapped with friends losing their jobs, and he works on one of the very few large-scale vessels remaining from his country, which still has access to traditional third-country waters. His living conditions onboard have improved slightly over the years due to vessel refits, but despite high market prices for fish, his salary has declined in real terms, in line with reduced catches due to lower quota allocations, time spent at sea and the increasing costs of fishing. *"I fear for my future as fishing is the only thing I know".*

Ahmadou (man, 25, crew, pelagic vessel, Adriatic (Senegal), fishers certificate)

Ahmadou migrated from West Africa some years ago in search of a better life, driven by climate change impacts in Senegal, and ended up settling in Italy. He first worked on an 18m pelagic trawler in the Northern Adriatic targeting anchovy and sardine, before finding another job on a pelagic seiner fishing for the same species. He is not a stranger to fishing, having grown up in a coastal community and he had already obtained a professional fisherman's certificate before migrating to Europe. He doesn't feel his job is very secure being employed on a contract basis, but with so few locals wanting to do the job he performs onboard given the impact of the climate crisis on catches and profits, EU nationals are becoming harder for owners to recruit. He hopes to stay working in fishing and knows that he is in demand. His major motivation is to earn enough to support himself and to send money home to his family in Africa. *"For me fishing is about helping my family back home, and that is important."*

Scenario 3: Contested Markets



Snapshot

By 2050, the world has limited global temperature rise to a moderate increase above pre-industrial levels. The EU has met its emission reduction targets and contributed to curbing biodiversity loss including through improved implementation of the CFP for the exploitation of fish stocks. However, reduced consumer purchasing power has shifted preferences towards cheaper imports and alternative proteins, drastically reducing demand for sustainable EU-caught fish. This has created fierce competition, pushing EU fishers to innovate and specialise in niche markets. Despite increased public funding and technological advancements, the fishing industry struggles with market competitiveness.

Key drivers in this scenario

Scenario 3 – Contested Markets: Primary drivers of change
• A **moderated planetary crisis** where worldwide efforts have managed to limit the impacts of climate change, biodiversity loss in marine ecosystems and pollution levels. While these impacts are still considerable, under this scenario they are not as severe as some of the current worst-case scenarios are projecting.

- **Demand for EU-caught fish is low** due to reduced consumer purchasing power that has shifted preferences towards cheaper imports and alternative proteins. This means that the industry is able to meet this lower demand for EU caught fish but must look to other activities to supplement revenues and safeguard jobs.

Scenario 3 – Contested Markets: Secondary drivers of change

- **Geopolitical landscape,** the unprecedented international cooperation to offset environmental crises has led to a general collaborative setting on environmental questions. However, the low demand for EU fish and competition from cheap imports creates new sources of disagreement.
- **Interactions and conflicts with coastal communities** and other coastal users continue to be a challenge, as the competition stiffens.
- **New technologies,** in the form of AI, new devices and software, have helped to modernise the fleet.
- **Greater availability and quality of scientific data** (in part due to new technologies) has improved the quality of fisheries sector's governance and decision-making.
- **Vessel costs (investment and upkeep)** have risen with the need to implement new technologies and the energy transition, but there is some funding support to help with this.
- **Funding sources continue to support the sector** with public funding available to support the adoption of innovative technologies and energy transition, though not necessarily fully sufficient to support the sector through difficult times.
- **Fisher demographics and recruitment issues** continue to challenge the industry, with uncertain financial returns discouraging young people from taking up this way of life.
- The **nature of work in the fishing industry** is changing with more emphasis on wellbeing and safety, though the traditional mental and physical challenges of a life at sea remain.
- **Fishing regulations and governance** focus on food safety, fisher welfare and sustainability.

How did we get here?

This timeline provides a general overview of the key events and issues that could lead to Scenario 3: Contested Markets in 2050.

2025-2030	2030-2035	2035-2040	2040-2050
• Major environmental crises across the world, including in the EU, become regular events. As a result, food safety and food security become prominent on the agenda, including for fish products. • Countries accelerate their concrete measures to limit global warming, biodiversity loss and pollution to a moderate increase above pre-industrial levels.	• The widespread adoption of new and improved versions of Electronic Monitoring Systems (EMS) across the region is now complete, significantly enhancing fisheries governance and accountability. • Marine aquaculture farms develop, including offshore in combination with the development of Offshore Renewable Energy (offshore wind farms).	• Third countries invest further in sustainable fishing practices and technologies, but regulations are sometimes less stringent than the EU's. • A breakthrough in products made from cell-based proteins of aquatic animals disrupts the market, offering a cheaper sustainable option.	• A global economic downturn affects consumer spending habits. • Political tensions between the EU and some third countries lead to trade restrictions and tariff changes.

Scenario narrative

Key driver 1: The impact of the planetary crisis is moderate

Increasingly destructive climatic events in the 2020s have sparked **unprecedented international cooperation** to fight the environmental crisis along with significant technological advancements achieved in the 2030s and, by 2050, **the planet is stabilising.**

The EU has met its emission reduction targets as part of the European Green Deal. Biodiversity loss has been curbed through the improved implementation of the CFP, thus supporting sustainable exploitation and relative resilience of EU fish stocks. New legislation has mandated significant improvements in reducing ocean pollution, with advanced technologies enabling more effective and efficient progress. Focus on the restoration of natural coastal ecosystems and limits to other anthropogenic impacts has helped curb **the adverse effects of climate change,** including rising sea levels.

By 2050, despite some mitigation of the worst effects of climate change, the **condition of EU waters** remains sub-optimal. EU policies have made a difference so that levels of eutrophication, acidification, and marine litter (plastics)

have all fallen compared with highs in the 2020s. However, they are still higher than ideal. While overall fish stocks are relatively stable thanks to mitigation efforts, the distribution and abundance of key species are shifting, creating both challenges and opportunities for EU fishers. Some stocks face continued pressure, leading to reduced quotas and economic hardship for fishers who rely on these species.

In response to the changing water temperatures and chemistry, and shifted **species distributions**, the EU has invested heavily in advanced marine research and adaptive management strategies. Northern species have moved northward, while southern species have expanded their range. Major technological advances have enabled the EU fleet to effectively deploy selective fishing gear, and enhanced monitoring systems have helped mitigate the mixed impacts on catches, economic benefits, and the livelihood of fishers.

The EU continues to be a strong advocate for food safety and sustainability at the international level along with a growing number of third countries. EU **standards for food safety and sustainable fisheries** are still among the highest in the world, but many countries are catching up, including through the training offered by the EU on quality control and sustainable management practices. The environmental situation and related EU standards enable fishers to operate in reasonable stability and predictability, but it requires ongoing investment in sustainability and compliance measures to keep up with internal EU competition and growing competition from fleets in third countries.

Conservation efforts to protect coastal resources have resulted in restrictions on both fishing and other anthropogenic activities in these areas, resulting in decreased numbers and consolidation of fleets. New and strong stakeholders have emerged, including renewable energy companies, eco-tourism operators and aquaculture production. These stakeholders play significant roles in shaping the use of coastal resources.

Faced with the shrinking of their fishing grounds, fishers and their representatives have actively engaged with national authorities to find acceptable compromises through **maritime spatial planning** agreements. This has helped to reduce conflicts between the various coastal actors. Resource-sharing issues still exist and are usually resolved in each Member State, often through regional-level dialogue. This localised approach allows for more tailored solutions that consider the specific needs and conditions of each region.

The strong emphasis on technology, food safety and sustainable fishing has made **education and skills development** crucial components of the fishing profession. Fishers often require retraining to adapt to new technologies and sustainable methods, ensuring they can meet the evolving technological requirements of the industry. The consolidation of fleets has required fishers to develop adaptable skills enabling them to transition between vessels with

potentially different gear, technology, and fishing practices. Training programs also emphasise business skills in effective marketing, sales strategies, regulatory requirements and financial management, preparing fishers to navigate the modern marketplace with confidence and digital know-how.

The net result of these anticipated changes in the status of the planetary crisis is that fish stocks within this scenario are anticipated to be moderately stable.

Key driver 2: Demand for EU-caught fish is low

Over the past decade, **consumer purchasing power** has shifted dramatically, leading to a significant reduction in demand for EU-caught fish. Despite the availability of quality, sustainable EU-caught fish, the market is flooded with cheaper imports. These imports often benefit from lower labour costs, less stringent sustainability regulations, and, in some instances, government subsidies, enabling them to offer highly competitive prices. Many consumers, who have seen a reduction in their purchasing power, choose these cheaper imports. For those consumers unwilling to sacrifice their commitment to protecting the environment, alternative proteins have advanced and offer cheaper sustainable options. As a result, EU fishers struggle to compete in a market where demand for their products has sharply declined.

Despite high levels of sustainability, the EU fleet faces a shrinking market for its products. As a result, the EU has attempted to renegotiate conditions for access to its markets for fisheries products through enhanced marketing standards and adapted trade rules to improve EU fishers' competitiveness. However, there was strong resistance from third countries, resulting in suboptimal agreements for the EU with limited effectiveness in bolstering demand for EU-caught fish. This **international competition** has pushed EU fishers to innovate and improve efficiency, leading to further consolidation within the industry. The remaining large-scale EU fleets have made significant strides in improving their fishing efficiency through technological advancements and operational optimisations. This helps it to compete on economies of scale, contributing to food security. However, imports still present strong market competition.

The shrinking market shares for traditional products have forced small-scale **fishers to specialise** in niche coastal species that are less subject to market competition. Speciality markets for sustainable or niche species have emerged, catering to environmentally conscious consumers who still demand high-quality, sustainably sourced seafood. Collaborations with local restaurants and food producers have created new market opportunities benefitted by seasonal tourism. However, the dominance of price sensitivity among the majority of consumers continues to be a significant challenge.

The net result of the anticipated changes within this scenario is that demand for EU-caught fish will be low. EU fish prices will rise making imports more attractive, especially if consumer demands for sustainability are outweighed by cost considerations.

What does this combination of drivers mean for the industry?

The fishing industry has continued to face significant **generational challenges** since the 2020s, with an ageing workforce and a shortage of young entrants. Low demand for EU-caught fish has impacted fishers' profits and made fishing a less financially secure career path for young people. However, a small number of innovative young people, raised in an era of hyper-climate consciousness, show interest in more innovative fishing methods aligned with their sustainable values.

With reduced demand for EU-caught fish and fishers facing fierce competition from imports, fishing activity is reduced in some coastal areas, and other industries and stakeholders seize the opportunity to expand their activities. Lower fishing activity leads to **changes in local economies and communities**, particularly those heavily reliant on fishing. Efforts to pass down traditional knowledge to maintain the cultural heritage of fishing communities have included educational programmes in maritime schools and tech-driven apprenticeships. These initiatives aim to blend traditional fishing skills with modern technologies, ensuring that the younger generation is equipped to handle contemporary challenges while respecting age-old practices. Despite these efforts, the perceived financial instability in the industry, environmental concerns, or the allure of alternative career paths, is leading to a gradual erosion of traditional fishing communities.

To solve the planetary crisis, the EU has increased funding for the **modernisation of fishing vessels and equipment** in the 2030s. The widespread consolidation of fleets has resulted in a smaller industry, making it feasible to provide targeted funding for technological upgrades. **Financial support** for sustainable fishing practices, and incentives for adopting innovative technologies were provided to reduce environmental impacts and improve operational efficiency. National-level loans for equipment upgrades and some private sector initiatives that provide the infrastructure for zero-carbon fuel adoption have also helped to support fishers. Additionally, training programmes were offered to help fishers develop new skills, including the use of advanced technologies, sustainable fishing practices, and marketing strategies. This support goes some way to helping EU fishers better compete with imported products.

With EU fishers facing intense competition from imports, technology ensures compliance with fishing quotas and regulations, reduces IUU fishing, and provides valuable **data for scientific assessments**.

Technological innovations play a critical role in enhancing fisheries governance and supporting sustainable practices. Electronic Recording Systems (ERS) use cameras and sensors on fishing vessels to monitor and record fishing activities. The widespread adoption of Electronic Monitoring Systems (EMS) across the region enhances transparency and accountability in the industry. Satellite and drone technology enhances the efficiency and effectiveness of surveillance capabilities. Fishing gear, such as selective trawls,[31] biodegradable nets, selective longlines, pole and line, and escape panels, allow fishers, who have moved to specialise in niche coastal species, to target specific species and sizes while reducing bycatch. Among others, these technologies and improvements also help to maintain fish populations and protect marine biodiversity in EU waters.

Many fishing communities are actively involved in **marine conservation** efforts, providing alternative or substantiating income sources for fishers facing industry challenges. Leveraging their knowledge of local waters and marine ecosystems, fishers have become integral partners in various environmental initiatives. For example, it has become common for fishers to be part of co-management arrangements in managing Marine Protected Areas (MPAs), habitat restoration projects, and citizen science initiatives. These efforts not only contribute to environmental sustainability, but also enhance the reputation of fishers as stewards of the sea.

Advances in aquaculture, including offshore farming and integrated multi-trophic aquaculture, have improved fish farming efficiency and environmental sustainability, while alternative proteins have been cultivated to help feed aquaculture stocks. These advancements offer **diversification opportunities** for some fishers who wish to leverage their expertise in a new context with an alternative (additional) income stream. However, while some transferable skills exist, the transition to aquaculture requires significant investment in new knowledge and practices. Nonetheless, aquaculture technologies have reduced pressure on wild fish stocks and minimised environmental impacts, whilst also providing cheaper alternatives to EU consumers who have decreased purchasing power.

In 2050, the **daily lives of fishers** have seen both improvements and setbacks. Working conditions, such as shifts to salaried crews and better safety protocols, have improved overall well-being at work, albeit in a limited fashion. However, the mental and physical health challenges associated with the demanding nature of the job persist, exacerbated by the economic pressures caused by the low demand for EU-caught fish. Social dynamics within communities have shifted,

(31) Selective trawls are modified fishing nets designed to reduce bycatch and minimise the environmental impact of trawling in the fishing industry. See sea fish, Box *Trawl*, 2024, available at: https://www.seafish.org/responsible-sourcing/fishing-gear-database/selective-device/box-trawl/

with third-country national migrant workers increasingly filling the workforce, reflecting the exit of EU fishers from the sector, due to its lack of financial security, leading to diverse but sometimes fragmented community structures.

Thought starters for Scenario 3 - Contested Markets

The scenario raises the following points:

- How can fishers integrate training into their daily routines to improve their proficiency with modern equipment, thereby enhancing their ability to catch niche coastal species?
- How can the fishing industry be made more appealing to younger generations, emphasising its role in sustainability and food security while addressing concerns about financial stability?
- Could alternative economic models, such as community-supported fisheries or direct-to-consumer sales, offer solutions to compete with cheaper imports?
- What strategies can be implemented to support fishers in managing vessel upkeep costs whilst demand for EU-caught fish is low?
- In what way could the EU ensure market competitiveness globally?
- Given the success of cheaper imports, how can the EU better market the quality and sustainability of its fish products to consumers?
- How can fishers be provided with the skills necessary to benefit from the development of marine aquaculture?

Profiles of future fishers in 2050 under Scenario 3 (Contested Markets)

For Scenario 3, we envision the following set of profiles (and personas) representing both small- and large-scale fishers. These profiles capture key characteristics, offering an illustrative view of what future fishers might look like in this scenario.

Small-scale fisher

Relying on uncertain market niches for survival

Situation

Moderating the planetary crisis has enabled the containment of the most negative climate impacts on the small-scale fisher, though challenges remain. While there have been some changes in fish species distribution and availability, **day trips within 12 nautical miles are still typical** for the small-scale fisher as they have

been for decades. **Catches have remained relatively stable but declined a little**, with climate change impacts on stocks moderated through fisheries management measures, and via modernisation of the fisher's vessel which has improved efficiencies. At the sectoral level, many of the small-scale fishers from 2025 have stopped fishing, and the number of new small-scale fishers entering the industry has not resulted in fisher numbers being maintained. Consequently, **there are significantly fewer small-scale fishers than in 2025**.

Working conditions

Onboard the fisher's small-scale vessel, **automation and greater safety** make fishing less demanding physically than in the past, **but working conditions are still hard** with greater unpredictability and severity in the weather. The small-scale fisher has **remote sensing, IT and AI technology onboard** to complement automated and robotic systems. Although maintaining the seaworthiness of older vessels and modernising them has been challenging for the small-scale fisher, given limited access to funds, it has been a key factor in the survival of those who have taken the risk to invest and who have managed to upgrade. The data that the small-scale fisher collects during trips using these improved technologies feeds directly into marine ecosystems research, fisheries management, and real-time monitoring of seafood markets. This makes the **small-scale fisher an active participant in fisheries governance**, transparency and sustainability.

Education and upskilling

Alongside mandatory qualifications, the small-scale fisher may hold a degree in fishing technology or fisheries-related subjects, and advanced qualifications in subjects such as marketing, distribution, finance or IT are also valuable. These have been enabled through a **variety of training programmes which the fisher may have accessed**. However, taking time out of fishing to upgrade skills has not always been feasible or practical. There is therefore a digital divide between small-scale fishers who have upskilled, and those who have not and find it harder to survive in the sector. Being experienced at sea opens **some opportunities for alternative income-generating activities in the blue economy.** The small-scale fisher's skill set is not always versatile enough to allow easy engagement with other income diversification opportunities, but some diversification has been possible with support to upskill/reskill/transfer skills for other blue economy activities at sea and on land.

Selling the catch

Market demand for the EU small-scale fisher's catch has fallen as consumers now view fish either as unattractive compared to other sources of protein or too expensive and luxury compared to imports. This is **negatively impacting on the fisher's profitability**. Facing cheap imported fish (which is not always certified or meeting the same sustainability requirements as EU-caught fish), and farmed fish and plant-based protein alternatives which now occupy a large segment of

the market, the small-scale fisher now focusses on less-common species or those that have emerged with the warming of the seas and for which very niche but secure markets exist. The small-scale fisher often collaborates directly with chefs at high-end restaurants or who cater at events, and provides unique, high-quality and specialised products not available through imports. **Sourcing proximity, a short supply chain, loyal buyers, and the personal touch** which the small-scale fisher provides, all play a big part in keeping the fisher's business afloat given very challenging market conditions. Despite real-time access to price information and the role of associations supporting the marketing of fishing products, in many regions and for many small-scale fishers the 'niche approach' remains difficult to achieve and hardly enough to sustain financial viability in the face of poor market demand for EU-caught fish and competition from fish imports and plant-based protein.

Income and quality of life

Uncertain profitability driven by climate change impacts (albeit not as bad as once thought likely) and the poor market situation for the small-scale fisher, mean that the **fisher's livelihood is tough**. The small-scale fisher remaining in the sector feels lucky to be able to survive given the challenging state of the market. The fisher **recognises the need to explore additional sources of income, including through playing an active role in the restoration of coastal habitats and ecosystems**, including in reducing marine pollution. The fisher has a feeling of unfair competition and of having been let down by the authorities despite the sacrifices and efforts made to modernise. Small-scale fleets have not attracted investments for consolidation, **obtaining financing from banks is far more difficult** than it was in the past, and many small-scale fishers have exited the industry. The small-scale **fishers that remain are often those who have benefitted from some EU financial support and some co-financing from banks for vessel modernisation** for climate change mitigation and adaptation. Given the poor market situation and its impact on fish prices and profitability, without this support the small-scale fisher would not have been able to invest and transition to carbon neutrality or keep up with the requirements for improved and more selective fishing gear. **Funding has not been unlimited however**, and not all small-scale fishers have benefited, meaning that many have stopped fishing, primarily because of the state of the market.

The small-scale fisher is under a lot of financial and emotional stress. Weakening of the social fabric and community cohesion in the fisher's community and a loss of coastal identity, exacerbated by urbanisation, have eroded the social networks and personal support the small-scale fisher relied on in the past.

Personas

Matteo (man, 50, owner-operator, lines/nets, Mediterranean (Malta), basic qualification in fishing technology)

With a liking for the outdoors, Matteo was inspired to make a life out of fishing having grown up with the sea all around him. To this end, he first got some experience on a local under-12m fishing boat, and then 25 years ago he took a loan and invested his savings in a multi-species/multi-gear vessel. He uses both nets and lines to catch a wide variety of species such as swordfish, dolphinfish, chub mackerel, scabbardfish, red shrimp, red porgy, john dory, red scorpionfish, and seabream. He felt confident at the time (despite the environmental challenges) that this would secure him a decent livelihood, being optimistic that the world would address climate change. However, he has since witnessed the share of the traditional market for his fish shrink (his sales are mainly in Malta rather than for export), without being able to do anything about it, as consumers started eating more farmed salmon and canned tuna and turned to cheaper imported seafood and cell-based proteins, which have also become affordable to most consumers. Consequently, the current financial viability of his business is threatened to the point that he can't recruit deckhands and has to look for other sources of income outside of fishing, or through occasional crewing on a large-scale vessel. This is not easy either as he is not the only one to seek work elsewhere. It makes him regret having gone into the industry. He feels that he played his part in investing in the necessary gear to keep up with sustainability requirements (with some EU support and access to a variety of other financing mechanisms). Now that the EU market has become flooded with cheap fish and consumers only seem to want to eat a few species (which he doesn't catch), he feels that the carpet has been pulled from under his feet. "*What is given to you by one hand, is taken away by the other. The art of fishing is being lost and I should have seen the writing on the wall*".

Elena (woman, 50, owner, line and netter segment, Black Sea (Romania), apprenticeship followed by an advanced qualification in fishing technology and fisheries management)

Elena entered the sector in her mid-20s when some women were making the choice of a career in fishing. She wanted to be part of a move away from women generally only being employed in post-harvest activities. For several years she was mentored by one of the few fisherwomen in her country at the time who had developed highly skilled and selective fishing techniques to supply local high-end fishmongers and restaurants. Her mentor also explained the complex array of regulations governing the sector, introduced her to a network of buyers, and taught her the importance of being pro-active and innovative in marketing, for example by using social media to sell her produce. Well-educated and aware of the necessity to manage fisheries sustainably, Elena was also determined to minimise the carbon footprint of her activities. Obtaining some funding from the EU through her high quality applications (which she knows others did not get), she has continued to upskill and modernise her vessel over the years, though her fishing methods are still traditional and the gear (longlines and gillnets) and species she targets (sprat, shad, anchovy, horse mackerel, bluefish, Atlantic bonito and golden grey mullet and demersal fish such as turbot and gobies) are still pretty much the same as in the past. She has good connections with local associations supporting her marketing and now relies on a couple of partnerships with chefs she supplies directly. She feels lucky to have succeeded in her marketing approach as it would be difficult to cover her costs otherwise. She believes that as long that she can continue to educate consumers and use a marketing strategy focussing on her lifestyle and values, she will withstand the increasing pressure from plant- and cell-based forms of protein that are becoming popular with consumers. As part of her engagement for sustainability and continued climate adaptation, Elena is also very active with local groups of fishers and coastal users in her community. "*It's not easy every day, there is a lot of unpredictability in resources, the markets and the business despite all the tech. I don't know who will come after me, but I feel lucky to do what I do and I want to continue inspiring young women and men"*.

Large-scale fisher

Struggling to compete in the market

Situation

Sustainability and restoration of fish stocks and marine ecosystems have been embraced by the large-scale fisher. Together with **adapted fishing gear** and only moderate changes in fish species distribution and availability, **catches by the fisher have remained relatively stable or declined only slightly** in recent

decades, and the most negative impacts of climate change, ecosystem degradation and pollution on the large-scale fisher's activities have been averted. Concentration of fleets, strongly driven by the negative market situation, have led to a **sharp decline in the numbers of both large-scale fishers and vessels**.

Governance and support

Climate actions and policies for the large-scale fleets are harmonised and collaborative at an EU-level (and have contributed to moderating the planetary crisis). However, the competitive nature of the EU market for fish has increased tensions between the large-scale fisher and the fishing fleets of other nations also supplying the EU market, leading to **disputed access to fishing grounds**. **Financial support** from the EU to modernise vessels (assisting some large-scale fishers but far from all of them), transition to carbon neutrality and improvements in the selectivity of fishing gear **have been essential** in enabling the large-scale fisher to play their part in sustainability. **However, times are hard as overall the profitability of operations has decreased** due to the investments in technology upgrades that the large-scale fisher has had to make alongside routine maintenance costs, and low demand for the fisher's catch. For the large-scale fisher who has made investments in innovative technology and for green transition, the poor market situation means that these investments are something of a gamble.

Qualifications and contribution to research

Because of the challenging business and natural environments in which the large-scale fisher operates, the fisher has **recognised the importance of relevant and accredited studies and training** and is adequately qualified to adopt and implement necessary automated processes onboard which involve remote and AI-guided technologies. The corporate and managerial nature of the fishing activity means that **the shore-based large-scale fisher/owner may hold qualifications in business management and marketing, as well as having acquired such skills through practice**.

Data on multiple research variables collected onboard by the large-scale fisher using advanced technology is directly transmitted to fisheries research and management institutes. The large-scale fisher is aware of the contribution this makes to good science and fisheries management and considers this important in preventing further declines in fish stocks. The information and forecasts generated are also helpful for advanced planning and more effective fishing operations. However, ensuring a sustainable and carbon neutral fishing sector places **heavy investment and reporting responsibilities on the shoulders of the large-scale fisher**.

Finding markets

Due to weak market demand, the large-scale fisher (and those facilitating the organisation of the markets), often does not find it easy to sell all the catch and **prices are generally low and often barely sufficient to generate a profit**. EU trade rules related to the import of fish have not protected the EU large-scale fisher from overseas competition. With price as the main driver for consumer purchases, and subsidies for fishing and aquaculture being provided by other countries that export fish to the EU, there is not a level-playing field for the large-scale fisher's landings. **The species which the fisher catches face tough competition**, especially as cheap imported (not always certified or complying with the same sustainability requirements as EU-caught fish) and plant-based protein alternatives are widely available on the market, and public concerns for animal welfare have grown. Because the large-scale fisher's products are insufficiently competitive on the market with mass imports of seafood, even though differentiated in terms of origin as reflected in labelling, **the large-scale fisher relies on some key strategic partnerships with buyers** to continue selling the quantities landed. These partnerships can however change or be broken quickly depending on market trends, and uncertainty in operational expenditure, sales prices, and revenues are all the norm. The large-scale fisher relying, to some extent, on the export of fish to countries outside of the EU is coping better than the fisher relying exclusively on the EU market.

Concentration and attractiveness

Drastic declines in sales prices and profitability for the large-scale fisher, coupled with a **concentration of ownership of many vessels in the large-scale fleet** in the face of financial pressure, are the main reasons for the overall reduction in the number of large-scale fishers. **New entrants to the profession are few**, owing to the instability in returns and wages, despite more attractive working conditions onboard. This makes it difficult for the large-scale fisher to attract long-term and qualified crew, as levels of salary and working conditions are not aligned with the wishes of most new entrants. The large-scale fisher owner sometimes recruits lower or unskilled migrant crews from outside the EU, in particular on less-automated vessels. In the face of labour shortages, some fishers have **sought employment in other blue economy sectors** which are now often better paying, but for those doing so, additional skills and training are often required.

Personas

Markas (man, 40, crew on a 12-24m vessel, Baltic Sea (Lithuania), diploma in engineering)

Markas moved to the coast in search of a job 20 years ago, where he thought of putting his engineering education and knowledge to use in the fisheries sector. He has worked onboard large vessels ever since, liking the working conditions. On several occasions he undertook complementary training to upgrade his skills and learnt to operate the modern fishing gear now used to catch new target species and fish more selectively. Over the years, he has grown to like the sea, but he gets frustrated when seals and cormorants prey on the fish he catches. But as a salaried crew, this is not his prime concern. He knows that the pelagic species targeted by the vessels he works on do not command a high price and that short fishing seasons are directly compromising his income. He also worries that shrinking demand lowers the need for people like him, especially as most things are automated onboard. "*The climatic and environmental challenges of the past have been replaced with worries about profitability and tough competition in the market. I am lucky to still be able to do what I do to bring home some earnings*".

Ivan (man, 55, owner of a 12-18m boat using demersal trawls, Adriatic Sea (Croatia), vocational training in fishing)

Ivan feels like he belongs to a dying breed of 'self-made' large-scale fishers. He's been fishing all his life, learning the trade from his father. His first boat was a small under 12m vessel, but with ambition, he secured sufficient funds to move up in size, eventually purchasing a larger boat. Though he has invested substantially in the upkeep of his vessel, he still largely relies on manual labour onboard. He realises that he somewhat 'missed the boat' when it came to automation and digitalisation of operations onboard. This penalises him, especially for post-capture operations (e.g. sorting, marketing) that could help with selling his catch (mostly European hake, Norway lobster, red mullet and deep-water rose shrimp). He follows the rules and is aligned with the standards for real-time monitoring and reporting to the authorities, but this makes him feel under constant scrutiny and he dislikes it. He is all the more resentful that the investments in technological improvements he had to comply with do not translate into higher income given the poor state of the market, and his business is only

surviving thanks to his dedication. Finding new crew is difficult as the expectations of the younger generation are high, and he is not optimistic about finding someone to take over from him when he retires (his children have left to get jobs in the city). Even though the impacts of the climate crisis have been largely contained and fishing conditions are relatively conducive, the pleasure he had from fishing is eroded bit-by-bit every day from the difficulty in selling his fish and the uncertain profitability. "*I've made sacrifices to stay afloat and adapt, and I'm sad to see that consumers prefer imported fish to mine. If there is an opportunity to sell my boat or decommission it, I will take it*".

Scenario 4: Scarcity and Survival

Snapshot

In 2050, the EU fishing industry faces a perfect storm of challenges. Climate change drastically alters marine ecosystems, making fish stocks unpredictable and harder to manage. This has required the EU to further reduce quotas and other fishing opportunities, forcing the processing industry to rely more on cheap imports, which are also facing reductions owing to the climate catastrophe worldwide and their need to prioritise their domestic markets. Consumers concerned about sustainability who cannot afford to pay a premium for sustainably caught EU fish, are turning towards alternative protein sources, further reducing demand for EU-caught fish. These pressures disproportionately impact small-scale fishers who lack the resources to adapt or compete with large-scale operations and cheaper imports. While some fishing communities are diversifying into tourism or other sectors, many face an uncertain future characterised by socio-economic hardship and cultural change.

Key drivers in this scenario

Scenario 4 – Scarcity and Survival: Primary drivers of change
• **A severe planetary crisis** where worldwide efforts have been both insufficient and poorly or unevenly applied so that climatic changes, pollution levels and biodiversity loss have severely depleted fish stocks. • **Demand for EU-caught fish is low**. Crumbling fish stocks are driving up prices and there is unfair competition from cheap imports from outside the EU.
Scenario 4 – Scarcity and Survival: Secondary drivers of change
• **Geopolitical landscape,** potential for conflicts and disputes over sovereignty and access to marine resources increase as a result of severe environmental crisis that exacerbates challenges linked security. • **Interactions and conflicts with coastal communities** and other coastal users continue to be a challenge. • **New technologies, in the form of AI, data, new devices and software,** are largely focused on finding stocks, optimising catches and finding the best sale prices in the marketplace. • **Greater availability and quality of scientific data** (in part due to new technologies) improve the quality of fisheries sector governance and decision-making, but their reliability is challenged by climate and environmental uncertainties and extremes. • **Vessel costs (investment and upkeep)** have risen, in some limited cases for those who have transitioned to new energies and technologies, but mostly, for all those who have not, to pay for severe increases in fuel prices. The amount of fuel consumed also increases due to extreme weather events forcing fishers to go further or for longer periods of time. • **Funding sources** continue to impact the sector, with private funding being limited because of low-profit margins and public funding facing intense competition for its resources. • **Fisher demographics, recruitment challenges and the nature of the work** in the fishing industry are all changing as the industry diversifies to survive. • **Fishing regulations and governance** focus also on food safety, fisher welfare and sustainability.

How did we get here?

This timeline provides a general overview of the key events and issues that could lead to Scenario 4*:* Scarcity and Survival in 2050.

2025-2030	2030-2035	2035-2040	2040-2050
• Marine heatwaves and extreme weather events become more frequent and severe. • International agreements aim to limit global warming to moderate levels above pre-industrial temperatures, but progress is slow. • Geopolitical conflict in some regions is pushing up global fuel prices, contributing to increasing costs for EU fishers.	• Coastal erosion and habitat loss accelerate, displacing communities and affecting fisheries. • EU fishing opportunities decrease as fish stocks decline and restrictions on fishing areas increase.	• A breakthrough in products made from cell-based proteins of aquatic animals disrupts the market, offering a cheaper sustainable option and lowering the demand for fish protein. • Global temperatures have significantly exceeded pre-industrial levels for several consecutive years.	• The rate of sea level rise has recently exceeded the adaptation capacity of vulnerable ecosystems, leading to significant coastal erosion and loss of coastal habitats. • Major marine heatwaves disrupt ecosystems in multiple regions and seas. • The North Atlantic current reaches a tipping point, potentially causing permanent changes in ocean circulation patterns, with other currents showing signs of similar vulnerability.

Scenario narrative

Key driver 1: The impact of the planetary crisis is severe

In 2050, fishers and consumers, and European societies as a whole, face a difficult world as **global temperatures have very severely exceeded pre-industrial levels**. Increases in intensity, reoccurrence and duration of marine heatwaves and other exceptional climatic events have exacerbated climate impacts on ocean and coastal ecosystems. Due to these impacts, the rate of sea level rise has recently exceeded the adaptation capacity of vulnerable ecosystems, such as small islands, low-lying coastal areas, and deltas. This has led to coastal erosion and loss of coastal habitats and ecosystems and significant declines in biodiversity.

This has come about due to **widespread inaction** amongst decision makers. The implementation and control of the CFP has been insufficient and has even backtracked in certain aspects, meaning that biodiversity loss has been profound. Similar reasons underpin the continued rise of pollutant levels in EU waters: eutrophication, acidification, marine litter and marine pollution directly and adversely affect marine food chains.

Catch composition of species and the diversity of fishing activities have changed. The distribution of northern species contracted due to an overall northward shift of their northern and southern boundaries. By contrast, the distribution of southern species expanded northward while also remaining available in the southern part of their habitats. Exploitable biomass of commercial stocks is more difficult to predict due to ecosystem change, with species like small pelagic being more impacted but recovering more quickly, due to their ability to track suitable thermal conditions compared with demersal species, which are more constrained in their adaptation capacities.

By 2050, fishing opportunities have been reduced drastically and a number of emergency measures have been triggered as a result of the severe environmental degradation. Facing reduced catches, limited fishing areas, and increased operational costs, the industry has experienced a decline, leading to a further **decrease in the EU market's self-sufficiency rate** for fishery products. There is an increased reliance on imports to compensate and meet consumer demand. The socio-economic impact of this decline is substantial, with job losses in coastal communities, emigration of younger generations to cities, and a ripple effect of economic disruption that affects the entire maritime supply chain.

The net result of these anticipated changes in the status of the planetary crisis is that fish stocks within this scenario are anticipated to have decreased significantly.

Key driver 2: Demand for EU-caught fish is low

Global market competition has intensified in the last decade, driven by increased competition from imported fish with lower production costs. While many consumers express a preference for locally sourced, quality sustainable seafood, such options are highly expensive due to collapsing stocks as a result of severe climate change. Fishers grapple with escalating operational costs, fuelled by high labour and fuel prices, further widening the price gap between EU-caught fish and their imported counterparts.

Price sensitivity remains a key factor influencing purchasing decisions, often leading consumers to choose more affordable (cheaper) imported options, aquaculture products or alternative sources of protein. This varies across consumer segments, with some willing and able to pay a premium for sustainable

seafood, while others, more constrained by budget, prioritise affordability above all else. This creates a complex and competitive market for EU fishers who must balance the need for economic viability with their commitment to sustainable practices. As a result, the **demand for traditional EU-caught fish declines**, and EU fishers find it increasingly difficult to sustain their livelihood.

The **rise of plant-based seafood alternatives**, like algae-based tuna and vegan shrimp, and the emergence of cell-based seafood, produced from the cultivated cells of aquatic animals, further disrupt the market. While these products appeal to environmentally-conscious consumers, particularly among younger generations, and are more affordable, their market share remains relatively small, and their ability to fully mimic the taste and texture of traditional wild fish remains a subject of debate.

The net result of the anticipated changes within this scenario is that demand for EU-caught fish will decline. Crumbling fish stocks, spiralling prices, and the proliferation of alternative options have created a cycle of ever-declining demand and rising costs.

What does this combination of drivers mean for the industry?

Due to **species distribution** changes, larger vessels that are able to get quotas, have relocated their operations further north, but less mobile small-scale fishers struggle to adapt to the changing distribution patterns of stocks. Some small-scale fishers have adapted by targeting invasive species in their local waters, for example, blue crab in the Mediterranean Sea. The volatile nature of the climate means scientific analyses have struggled to keep pace with the rapidly changing context, leading to increasing uncertainty in scientific advice. Although technological development is constantly improving accuracy, challenges remain in this area.

This limited accuracy may lead to more **precautionary management measures**, including lower total allowable catches, stricter technical measures, and limits on the number of operational vessels. However, the rapid pace of climate change often outpaces the ability of regulators to adapt, leading to criticism that quotas are often set too high or too low, failing to effectively protect vulnerable species or provide reasonable balance between fleet capacity and fishing opportunities.

The expansion of MPAs as part of international **conservation efforts** and increased use of maritime areas for other activities, such as the development of renewable energies, have further restricted fishing zones, affecting EU fishing fleets' operations, particularly for small-scale coastal vessels. The decline in fish stocks has heightened tensions between EU Member States and neighbouring countries, particularly in the context of exploitation of shared fish stocks. For instance, disputes over mackerel and herring quotas in the North Atlantic have

escalated, leading to increased patrols and a rise in illegal, unreported, and unregulated (IUU) fishing.

There have been some attempts at **international cooperation**, such as the establishment of joint research programmes to monitor fish stock health and the development of regional agreements to combat IUU fishing. However, these efforts are often hampered by mistrust, differing priorities, and the urgency of the crisis, which often leads to short-term solutions at the expense of long-term sustainability.

By 2050, the use of **advanced technologies** to locate, catch, and sell the remaining fish stocks is crucial to cope with severe climate changes. However, low profit margins and limited public funding for technological upgrades, due to reduced economic viability and pressing climate change priorities, create a challenging environment for fishers to invest in necessary technologies. Fishers find themselves trapped in a vicious cycle: their inability to adapt to changing conditions results in reduced catches and diminished profitability, which then restricts their capacity to invest in new technologies or strategies that could help them better navigate the evolving marine environment.

The adoption of **advanced technologies** is uneven. Larger fishing enterprises, with their greater financial resources, have readily integrated AI and data analysis into their operations, maximising their catch efficiency and further outcompeting smaller-scale fishers. Some small-scale fishers are attempting to leverage technology to their advantage, utilising online platforms and direct-to-consumer models to access niche markets for sustainably caught, local species. However, the reach of these initiatives remains limited, and they often struggle to compete on price with larger, more technologically advanced operations.

The inability to generate sufficient profits leads to a **consolidation of fishing rights** by few investors to achieve economies of scale at the expense of traditional fishers. This consolidation helps sustain some operations, but the diversity and resilience of fishing communities are reduced. As profits dwindle and coastal areas continue to degrade, small-scale fishers continue to be driven out, and the industry has become dominated by a few large players who struggle to maintain operations without significant technological investments.

To adapt to these challenges, there is a growing need for **diversification in the fishing industry** and sustainable aquaculture practices are being promoted as a possible supplementary income stream. However, aquaculture also faces challenges due to climatic impacts, which can affect, among others, infrastructure which is highly vulnerable to extreme weather events. Efforts from fishers are now focusing on finding new markets and targeting other sectors, like pharmaceuticals or cosmetics, selling products like fish oils, fish collagen or fish scales to provide supplementary revenue. To create new avenues of income, fishers are also branching out into parallel roles like seaweed farming, which is used as a low-

carbon livestock feed source and a key source of biomass for other uses (cosmetics, nutraceuticals, pharmaceuticals, bioplastics), in addition to its potential in terms of regenerative farming. Fishers are also taking up dynamic fisher-scientist roles. This enables fishers to apply their knowledge to new areas.

Traditional **coastal fishing villages** have undergone significant transformations in response to the decline of the industry. Some have successfully leveraged their heritage, turning it into tourist destinations that offer visitors a glimpse into historical fishing methods and marine conservation practices. Museums, cultural centres, and eco-tourism activities have flourished in these areas, preserving some cultural identity of fishing communities, while providing some alternative income streams. Conversely, other coastal fishing villages have faced depopulation, with younger generations moving to urban areas for better opportunities in more stable and growing industries, leaving behind ageing populations and struggling local economies.

Thought starters for Scenario 4 - Scarcity and Survival

The scenario raises the following points:

- How can fishers adapt to the increasing uncertainty in scientific advice due to rapid environmental changes?
- Should EU fishers consider market opportunities for fish-derived products in non-traditional sectors like pharmaceuticals, cosmetics, and agriculture (e.g., fish oils, collagen, scales)?
- Should the fishing industry consider developing multi-functional vessels to increase economic viability? If so, what challenges would need to be addressed regarding certification, training and operational flexibility?
- What social safety nets and support systems are needed to assist fishers and fishing communities facing economic hardship due to climate change and market shifts?
- With very little public funding for technological upgrades, what other mechanisms can enable fishers to make use of advanced technologies to locate, catch, and sell the remaining fish stocks?
- With traditional fishing facing decline, how can the EU ensure food security from its waters?

Profiles of future fisheries in 2050 under Scenario 4 (Scarcity and Survival)

In Scenario 4, we foresee a range of profiles (and personas) depicting small- and large-scale fishers. These profiles provide a plausible and insightful portrayal of future fishers within this scenario.

Small-scale fisher

Beyond tipping point for renewal

Situation

Unpredictable seas and weather make **fishing and working conditions perilous** for the small-scale fisher. Important changes in species composition and distribution over recent decades have meant a complete **overhaul in fishing operations**, with different fishing grounds and fishing gear needed to catch traditional species, as well as to target some new species that have emerged and can be marketed. However, many species that are now more abundant due to climate change, are predators of traditional target species and have had a negative impact on catches of traditional species, while not being in demand by consumers. For the small-scale fisher, keeping up with these changes and the increased competition among fishers is very challenging. The increased severity and unpredictability of extreme weather events can result in significant gear losses and puts the viability of the small-scale fisher's operation at risk.

Declines in stocks due to warming seas, ecosystem degradation and marine pollution, mean that the **small-scale fisher finds it very difficult to catch sufficient volumes of fish**, which are limited anyway following the drastic decrease in fishing opportunities. Health and safety regulations, marketing bottlenecks, and high energy and operating costs **reduce profit margins** and the small-scale fisher's capacity to invest in technological improvements to adapt to tougher seafaring conditions and new target species. The administrative and managerial workload associated with complying with regulations, participating in public procurement, and operating and maintaining complex technologies poses significant challenges to the small-scale fisher. As a result, and because of the combined negative impacts of the planetary crisis and weak market demand, the **number of small-scale fishers has drastically reduced compared to 2025**, and this jeopardises the very survival of the small-scale sector. For the small-scale fisher who survives, **cooperative working models** are essential to better face the increased economic pressures, and are used to pool resources, share technology, and gain better market access.

Place in the blue economy and recruitment

The small-scale **fisher's interests have waned in blue economy development policies** and the prioritisation of other fishing and maritime interests. This is reflected in the limited financial support given to the sector and an overall loss of bargaining power of the fishing industry.

On land, especially in small coastal communities affected by the emigration of the population in search of better living conditions and work opportunities further inland and in cities, harbours have not been upgraded and it is **not always safe**

for the small-scale fisher to land fish. Erosion of the local social fabric in the community where the fisher lives has led to a loss of identity and a decline of the fishing profession, which is not attracting new entrants. Furthermore, emigration of coastal dwellers and dangerous working conditions at sea due to extreme weather events (which are particularly risky for those on small vessels) are negatively affecting **labour force availability**.

Selling the catch

The market demand for the small-scale fisher's catch has fallen as consumers view it as too expensive and a luxury compared to imports, and this is negatively impacting on the fisher's profitability. Facing cheap imported and/or farmed fish and plant-based protein alternatives which now occupy a large segment of the market, **the small-scale fishers remaining now focus on less common species** or those that have emerged with the warming of the seas and for which very niche markets exist, but need to be secured.

The small-scale fisher finds it difficult to add value and sell locally, or to increase the appeal of less familiar species to consumers. This is compounded by requirements as part of **certification scheme** standards that are challenging and costly for the small-scale fisher to comply with and which **no longer guarantee any increased market share or better prices**.

However, **preference for fish of local origin** by some (notably higher income) consumers **still gives the small-scale fisher's catch a small advantage in the market over mass imports**, even though selling at a high price is difficult and **demand is confined to very specific outlets** (e.g. local high-end restaurants, online sales, local markets).

Diversification on land and inequalities

Consumers' willingness to pay is as volatile as the geopolitical situation, which adds to the difficulty to plan fishing trips and related business activities and increases uncertainty over financial returns. This has had a huge impact on the livelihood of the small-scale fisher who has had to **resort to other, non-fishing, complementary occupations in other blue economy sectors to make a living,** even though **these are hard to come by**. The fisher has become part of the 'have-nots' in a Europe with many persistent inequalities. Coastal tourism is also negatively impacted by climate change in some coastal areas, such that it is no longer the natural or guaranteed diversification strategy that the small-scale fisher could tap into in the past for a reliable supplementary source of income. The struggle to deal with and adapt to the difficult and changing situation in which the fisher operates (climatic, technological, and market) means the fisher is under huge stress with negative mental health implications.

Personas

Frederik (man, 45, owner, Baltic (Denmark), vocational training in fishing technology)

Frederik is the owner of a polyvalent under-12m boat fishing for cod and herring. He was born near the coast and decided to make a career from fishing, targeting his studies to this end and accumulating at-sea experience as a deckhand onboard large-scale (over 12m) vessels in the first years of his career. He then undertook advanced safety training and obtained a skipper's certificate of competency to move up the ladder. Eventually he was able to purchase a boat and become his own boss. Despite his personal commitment to sustainable fishing practices, his catches have steadily decreased over the last 25 years because of the warming of the seas, reduced quotas, and encroachment of his fishing grounds by other activities. He doubts the effectiveness of management measures, feels marginalised in decision-making processes and unfairly penalised by the rules, which he is increasingly unwilling to abide by. He often feels vulnerable at sea, despite his experience and the onboard safety and protective equipment he has to wear to protect himself. The scale of his operations is now very small and much less commercial than before, and he often has to resort to odd jobs for offshore windfarms, for which he is not always fully trained or equipped. Running his business feels like a daily gamble given the uncertainty of the weather, poor catches and weak sales, even though he still manages to play the 'local' card and supply his marine products to long-standing local buyers and loyal consumers. He is hoping he will manage to continue fishing until he retires but does not think anyone else will take over. "*There aren't many of us left. Small-scale fishers like me are part of folklore. Soon you'll find us guiding tours in a fishing museum!".*

Dimitrios (man, 60, owner, Ionian Sea and Central Mediterranean Sea (Greece), no formal education)

Dimitrios owns a 6m boat, has fished using nets to catch species such as hake all his life, and considers himself part of a dying breed. Today he is reaching the end of his fishing career and is still going to sea because he loves it, but only occasionally and on a part-time basis to sell fish to acquaintances. For him, it has become pointless to advertise and promote his catch to consumers who prefer readily available and cheaper farmed fish, imports from other countries, or even lab-grown protein. What he does not sell he keeps for his own consumption. The

species he was targeting in his youth are less abundant and he has not been able to follow shifting stocks because of the limitations in his vessel capacity. Unwanted species such as jellyfish are a nuisance to his operations, and investing in new gear was out of reach because he found it too difficult to access any sort of financial support. His past efforts to comply with management requirements have yielded so few benefits that he has become suspicious of any new management measures. Demand for his catch has always been quite seasonal, and the community where he lives is no longer bustling with fishing and tourism activities. His friends who invested in *pescatourism* are now in difficulty because tourist seasons have shortened and numbers have declined as the coastal environment is no longer hospitable in the hot summer months, and dangerous in winter months due to storms. His children and many members of the community have also left, leaving him feeling isolated and disgruntled about the whole situation. "*The good days of fishing have gone; planets have aligned for the demise of our small-scale fishing sector. I don't know what it would take to give small-scale fishers like me – or younger! – a chance of survival under the present climate and market conditions*".

Large-scale fisher

The swan song

Situation

The large-scale fisher, operating large vessels which make multi-day fishing trips and can travel far from their home ports, has to some extent been able to **adapt fishing location to match changes in species distributions**. This has required a complete overhaul in fishing strategy, but which has not succeeded in compensating for an **overall decline in catches** due to the warming of the seas, ecosystem degradation and marine pollution. Many large-scale fleet segments no longer exist at all because the minimum catches and prices required for financial viability are not being met, or because the costs of vessel modernisation have been too high. Many large-scale vessels have been scrapped or re-purposed for other maritime activities where this has been possible. With declining vessel numbers, many businesses supplying the large-scale fisher with goods and services have shut down their operations in harbours where a critical mass of fishing activity is no longer present. Fishers are thus more concentrated in the few fishing ports that remain viable and operational.

Governance and consolidation

Increased sovereignty over fish stocks by third countries, disputed quotas, and a rise in marine protected areas and offshore blue economy activities are all **reducing the large-scale fisher's access to fishing grounds** and limiting

capacity to follow the fish in their new distribution ranges, for example further northwards. The large-scale fisher is **more confined to EU waters** than in the past. To stay profitable, and with **challenges in attracting investment** from within or outside of the sector and from banks, the large-scale fisher's vessel is now often part of a **large-scale fleet that has consolidated** and is owned by a large corporation. **As a result, the number of both large-scale fishers and large-scale fishing vessels is far less than in 2025**.

In the eyes of the large-scale fisher, the **investments** made and commitments to new technologies and data collection systems onboard **have not yielded the expected improvements in catches due to climate-related uncertainties**, and the large-scale fisher views science-based fisheries management with some suspicion. Given limits to public funding, the large-scale fisher received little financial assistance from the EU to make the compulsory vessel modernisation investments to transition to low-carbon fishing. **Vessels spend less time at sea** than in 2025 and catch fewer fish, which has a **negative impact on the large-scale fisher's earnings**.

Safety and recruitment

Despite improvements in technologies and safety protocols, and less susceptibility to extreme weather events than small-scale vessels, **large-scale vessels remain a dangerous place of work** given the unpredictability of seas and extreme weather events. The poor market situation and low profitability also mean that fishers take increasing risks in their efforts to catch fish which compromises safety. For the large-scale fisher, the increasing danger and lack of attractiveness of fishing as a career, compounded with the **continued ageing of fishers**, makes it challenging to recruit crews. This is even with automation and robotisation onboard somewhat offsetting the physical demands of the job, and with living conditions having improved on larger vessels compared to the past.

Marketing and profitability

In 2050, **consumer demand for the EU large-scale fisher's catch is extremely low**, following dramatic shifts in consumer preferences towards alternative forms of protein and cheap fish imports in European markets. The large-scale **fisher often does not find it easy to sell all the catch** and prices are often barely sufficient to generate a profit. EU trade rules related to the import of fish are failing to protect the EU large-scale fisher, and with price as the main driver of consumer purchases, and subsidies for fishing and aquaculture being provided in other countries which export fish to the EU, there is not a level playing field for the large-scale fisher's landings. Organisations trying to support the fisher with planning and organising the sale of catches are generally not able to solve these difficulties. This is affecting the large-scale fisher all the more as consumer tastes have shifted towards fewer, more widely available, species. **The large-scale fisher faces tough market competition,** and with consumer demand also

evolving towards non-marine alternative or lab-based protein sources, even certification does not guarantee good sales and price premiums. **Covering trip operating costs, let alone planning for vessel and engine re-investment in the future, is therefore incredibly difficult** for the large-scale fisher. This situation is worsened by the volatility of the international and European geopolitical situation, which affects prices, imports and sales, and makes it difficult for the large-scale fisher to plan and run the fishing business profitably. Continuing to supply the fishmeal and fish oil industry along with **seeking new markets,** such as exports or venturing into high-tech non-food fish commodities for the pharmaceutical and cosmetic industry, **offers some small glimmer of hope** for the large-scale fisher. But overall, the **large-scale fisher is despondent about the current and future situation**.

Personas

Remco (man, 45, crew, 28m vessel, North Sea/English Channel (Belgium), university degree)

Remco started working as crew onboard one of the few large-scale vessels left in Belgium, even if his university degree made him overqualified for this type of job. He knows that market prices for plaice, sole and Norway lobster, which are his target catch, don't compensate for high vessel running costs given the diminished catches these days, and that profitability of the vessel on which he works is marginal and fluctuates year to year. The good years only just manage to keep the vessel going during the bad ones, and his vessel relies strongly on national demand for the species he catches. Onboard he often works alongside migrant workers from outside the EU. He has become despondent about the future having seen the fishing sector, always dominated by large-scale vessels in his country, gradually shrink over the years. He feels he is part of dying breed and is actively seeking employment onshore in a service sector job which offers better and more reliable pay, and which is safer. *"Being a fisherman has given me the chance of a new start in life, but I'm not sure how much longer I can put up with this life any more…it is so hard, and the rewards are so few. I am looking for something else, and I'm not the only one."*

Pawel (man, 50, owner of 24-40m vessels, Baltic Sea (Poland), degree in engineering and fishing technology)

Pawel became a vessel owner in his 30s and expanded his fishing business by acquiring another two 24-40m vessels a few years later. Fishing and market conditions were already tough, and he has remained compliant with tight EU regulations to protect stocks and marine ecosystems. Today, he can't sell his catches at a good price in the face of cheap imports, and he cannot cover his operating expenses. This is all the more so because prices of energy and other goods have spiralled upwards due to the uncertain geopolitical climate. Pawel is not alone in this situation, which is typical of the declining large-scale fleet segment due to challenging financial viability. He feels let down by EU policy negotiations to secure fishing grounds and the lack of grants, but has given up lobbying for his rights alongside other fishers. Today he is considering his options, but the future looks bleak: either he accepts an offer to be taken over by foreign investors and for his vessels to be absorbed into a fleet over which he has little direct control (with one of his vessels likely to be scrapped in the process); or he decommissions; or he goes bankrupt under a mass of debt. "*I have witnessed the impact of the scrapping of boats and how much it has degraded the fishing community and profession. I don't see any better prospects.*"

5. Conclusions and recommendations

This study represents a significant milestone in understanding emerging challenges in the fisheries sector and their probable impacts on the sector. As the first foresight exercise of its kind for fisheries, the study employed a comprehensive, participatory, and people-centered methodology. Using mixed methods and relying on a network of country experts, the study team ensured extensive consultation and close interaction with fishers from all 22 EU coastal Member States and outermost regions, as well as with Advisory Councils, social partners, producer organisations, policymakers, fisheries experts and other stakeholders at both EU and local levels.

The resulting four scenarios and their associated fisher profiles provide a forward-looking exploration of potential futures for EU fisheries. Designed without bias toward any particular outcome, the scenarios reflect plausible trajectories that highlight both the sector's vulnerabilities and its opportunities. They serve as tools intended to guide policymakers and stakeholders in anticipating challenges, designing targeted interventions, and supporting the structured adaptation of EU fisheries to current and expected challenges.

By fostering debate and encouraging further exploration of specific fleet types and regional dynamics, the scenarios and profiles aim to deepen understanding and stimulate action. Ultimately, this study aims to support the long-term sustainability and resilience of EU fisheries, enabling it to adapt to the evolving needs of society and the environment.

Below we expand on these overall conclusions and suggest some next steps and key policy actions for the future. Adding to this, Appendix 8 presents some lessons learned for future foresight work.

5.1. The four future scenarios

The four future scenarios presented in Chapter 4 have been produced following an extensive programme of background research and inclusive debate with fishers and stakeholders across the industry.

In keeping with foresight methodology, rather than being taken as predictions of what might happen twenty-five years hence, they should be understood as representing **alternative possible futures for the EU's fishing industry and those working in it**. Each scenario is still possible at the time of writing this report, although some would involve significant geopolitical shifts. They have been constructed from two key drivers that stakeholders described as being crucial and uncertain: hence, it is possible that the future of the planetary crisis in 2050 will be severe; it is also possible that efforts being made over the coming

decades may moderate the worst effects of climate change, pollution, and biodiversity loss. Similarly, it is possible that demand for EU-caught fish is high (and potentially higher than the industry will be able to supply), while it is also felt to be possible that the reverse be the case.

These two alternative versions of each of the two main drivers have created a 2x2 matrix of four possible worlds: Thriving Responsibly, Chasing Declining Stocks, Contested Markets, and Scarcity and Survival. While there are some commonalities (such as the potential for geopolitical upheavals to significantly disrupt life in the EU and how fishing and fishers operate, for example), **each of these worlds will offer unique challenges and opportunities for those in the industry**. We have attempted to provoke thought, discussion and, potentially, actions appropriate for each scenario and we have assessed how the secondary drivers identified early on in the process would also look within each scenario. The study team also used the scenarios as the foundation for the creation of the profiles of fishers for 2050.

As we start the journey towards 2050, we would invite the industry to keep these scenarios in the front of their minds and to look for signals of change. While, at the time of writing this report, the evidence available to the team suggests that all four scenarios are possible, that will not necessarily remain the case, especially as we get closer to 2050. Evidence of environmental degradation continuing, or worse, accelerating, may suggest that Scenario 2 (Chasing Declining Stocks) or 4 (Scarcity and Survival) are becoming more likely, while evidence that efforts to combat climate change are working may suggest that Scenarios 1 (Thriving Responsibly) and 3 (Contested Markets) look closer to the likely future. Signs that demand for EU-caught fish is declining, perhaps due to attractive, high quality and publicly acceptable alternative protein sources entering the marketplace, for example, might tip the scales towards Scenarios 3 (Contested Markets) or 4 (Scarcity and Survival), or the reverse might be the case, making Scenarios 1 (Thriving Responsibly) or 2 (Chasing Declining Stocks) more likely.

Given the scope of the study, the scenarios also had to encompass several realities and remain general. It is evident however that the future will look different per sea basin and fleet segment. Examining how different fleet types, targeted species and regional/national/local contexts will evolve under each scenario, and potentially require differentiated policy interventions, is a next step in this reflection.

Whatever the future will be, the scenarios aim to **inform further the debate, investment, innovation, and action** that the fishing industry will need if it is to thrive into the middle of the century and beyond.

5.2. The profiles of future fishers in 2050 (a comparative analysis)

Anchoring the profiles in the future scenarios and geographic realities

The profiles of future fishers recognise, either explicitly or implicitly in the text, many drivers of the future. These drivers include the two primary ones and many other secondary drivers considered as potentially important in Phase 2 (exploration of future worlds). The two main drivers of the future scenarios (the state of the planetary crisis and consumer demand) frame all profiles and all personas.

Appendix 7 provides an overview of the contents of the profiles and personas. All the EU sea basins and the outermost regions are represented in the personas, and personas are provided for both owners and crew. The personas cover fishers using a wide variety of fishing gears and targeting many different species, and reflect 16 different nationalities, including one non-EU national. Three of the personas are women and 13 are men.

However, and as previously noted, under any one future scenario, **"fishers" cannot be taken as a homogenous group**, and even within the small- and large-scale fisher sub-groups and across sea basins, there will be (as today) thousands of different lived realities.

What the profiles tell us about fishers of the future

Some conclusions from the profiles and what they suggest about the future are that there is a lot of uncertainty: about how the future might evolve, about the relative importance of different drivers, and the extent of each driver's impacts. There are some similarities in the future fishers profiled in the four scenarios. This is to be expected given the methodological approach of having two primary axes, which means that under two scenarios one of the main axes remains unchanged. Similarities also reflect some commonalties in the articulation of the secondary drivers across the scenarios, for example the assumption that under all scenarios there will be significant changes in terms of **technology and digitalisation**. However, the profiles also reflect many important differences in the future fishers described under the four plausible futures.

The profiles and personas for the most positive future scenario (Scenario 1: Thriving Responsibly) show that even under this scenario the future would be challenging for fishers, and **fisher numbers are likely to be lower than today**. The most negative future scenario (Scenario 4: Scarcity and Survival) would be devastating for fishers and for the EU as a whole, with very significant declines in

fisher and vessel numbers, and serious impacts on the social fabric of fishing communities.

The profiles suggest that the **present/past will also shape the future for fishers**, not just the drivers, with current characteristics, concerns and deeply-engrained attitudes of fishers not disappearing completely, but rather evolving in the face of and in response to the future scenarios and their drivers.

The profiles also make clear that small-scale and large-scale fishers will be impacted in different ways under each scenario, and across the different scenarios. The resilience and ability of small- and large-scale fishers to adapt to different futures will be varied.

5.3. Possible next steps and further questions for reflection

On completion of this study, it may be appropriate to take the profiles as a starting point for **further analysis of specific and different fishing metiers and/or sea basins**, should the Commission or stakeholders be interested in doing so. This would enable the profiles to better reflect the specificities of different stakeholder groups or geographical areas.

In addition to the "thought starters" outlined in each scenario, several questions would warrant further exploration, given uncertainty over the future scenarios, and how and, to what extent, different drivers will impact on fishers of the future:

- How would profiles for fishers owning or working on specific types of vessels or in specific sea basins differ to the more generic ones provided during the study?
- How and in what ways could policy help us move towards more positive scenarios?
- What will the actual level and state of technology be in the future, and how fast will the uptake be by fishers of digitalisation and AI? Will this be rather universal, or within a trend towards increased technology, will there be a large technology and digital divide as suggested in the profiles?
- To what extent will traditional practices, inertia and an unwillingness to change slow the pace at which the fishers of today change in the future? Conversely, to what extent will the drivers of change, and an inherent willingness of fishers to innovate and adapt, speed up the pace of change?
- How will the future shape gender equity and equality in the fisheries sector, and what will the role of women be? The profiles and personas suggest a

potentially greater role of women in fishing in the future ([32]), as opposed to the current norm of women being more involved in the processing sector. Whilst some scenario drivers will play out positively on the attractiveness of fishing for women, questions remain regarding the speed at which prevailing cultural and societal norms will lift to really enable and encourage more women to fish and be recognised in the profession.

- How will the drivers of change that impact fishers also impact those working in other sectors, and vice-versa? For example, could certain factors cause the decline/absence of businesses that supply key inputs needed by fishers to run their operations? How will the climate crisis affect tourism patterns and the opportunities this will present to fishers in the future? Although the indirect impacts of these drivers of change were beyond the scope of the study, they will require consideration in future policies and developments for the sector.

5.4. Policy focus for the future

Finally, across all scenarios and fisher profiles, some key policy topics worthy of further consideration emerge:

- **Promoting planetary resilience**: Investing in adaptive management and marine research to mitigate environmental uncertainties and safeguard fish stocks.
- **Supporting technological and digital transition**: Providing funding and training to ensure equitable access to green technologies and digital skills fostering innovation across fleets.
- **Enhancing market competitiveness**: Strengthening trade policies, supporting local markets, and promoting traceability to differentiate EU products in global markets.
- **Encouraging workforce renewal**: Addressing recruitment challenges through improved working conditions, gender inclusivity, and targeted financial incentives.
- **Fostering diversification**: Enabling fishers to engage in aquaculture, conservation, and other blue economy activities, reducing exclusive reliance on traditional fisheries.

The future scenarios and fisher profiles are just possible and plausible realities. Policy/action by the EU institutions, Member States and other stakeholders has

([32]) 20% of the future personas are women. This is around 8% more than the number of women employed in fisheries in 2022 (Freeman and Svels, 2022).

the potential to influence and react to the drivers affecting the future, and thus to some extent to influence who the fishers of the future will be, their characteristics and attitudes. Policymakers should now reflect on the scenarios and profiles depicted in this study to **consider their implications for the sector**, and ways in which policy could accentuate the positive aspects captured in the profiles and mitigate and combat the negative ones. In short, we should ask what future we want and what we need to do, now, to get there.

Appendix 1: List of information sources

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Appendix 2: List of stakeholders who participated in the study

Fishers who were consulted in Phase 1

Member State	Under 12m	12-24m	24m+	Women	Sea Basin	Nr
Belgium	The Flemish Institute for Agriculture, Fisheries and Food Research (ILVO) and Rederscentrale were interviewed. Fishers were unavailable or uninterested in Phase 1, but additional efforts to engage them in Phase 3 led to valuable input.					
Bulgaria	FGD	FGD	-	No	Black Sea	21
Croatia	FGD/KII	-	-	Yes	Mediterranean	9
Cyprus	FGD	FGD	-	No	Mediterranean	14
Denmark	FGD/KII	FGD/KII	-	No	North Sea	9
Estonia	KII	KII	KII	Yes	Baltic	7
Finland	KII/Survey	-	-	No	Baltic	9
France	FGD	KII	FGD	Yes	Atlantic, Mediterranean and outermost regions (Reunion)	10
Germany	An NGO working with regional fishers and the chairman of regional Fisheries Local Action Group (FLAG) were interviewed. Fishers were unavailable or uninterested in Phase 1, but additional efforts to engage them in Phase 3 led to valuable input.					
Greece	FGD/KII	FGD/KII	FGD/KII	No	Mediterranean	12
Ireland	FGD	FGD	FGD	No	Atlantic	5
Italy	KII	FGD/KII	-	No	Mediterranean	12
Latvia	FGD	-	-	Yes	Baltic	16
Lithuania	Survey	-	Survey	Yes	Baltic	12
Malta	FGD/KII	FGD/KII		No	Mediterranean	7
Netherlands	A marine social scientist and the Pelagic Freezer Trawler Association were interviewed. Fishers were unavailable or uninterested in Phase 1, but additional efforts to engage them in Phase 3 led to valuable input.					
Poland	FGD	-	FGD	Yes	Baltic	8
Portugal	FGD/KII	FGD/KII	No	No	Atlantic	7
Romania	FGD	FGD	-	No	Black Sea	19
Slovenia	FGD/KII	-	-	Yes	Mediterranean	3

Member State	Under 12m	12-24m	24m+	Women	Sea Basin	Nr
Spain	FGD/KII	FGD	FGD	Yes	Atlantic & outermost regions (Tenerife)	16
Sweden	FGD	FGD	FGD	Yes	Baltic	2

FGD=Focus Group Discussion; KII=Key informant interview

Stakeholders who participated in workshops in Phase 2

Stakeholder category	Organisation
Social partners (2)	European Transport Workers' Federation (ETF) Europeche
Advisory Councils (9)	Baltic Sea Advisory Council EU Long Distance Fisheries Advisory Council Market Advisory Council Mediterranean Advisory Council North Sea Advisory Council Northwestern Waters Advisory Council Outermost Regions Advisory Council Pelagic Stocks Advisory Council Southwestern Waters Advisory Council
Interest groups – Environmental (5)	Marine Stewardship Council Oceana Sciaena Seas At Risk Worldwide Fund for Nature (WWF)
Interest groups – Fisheries (8)	Conxemar European Association of Fish Producer Organisations (EAPO) Federação das Pescas dos Açores Fédération Nationale organisations de producteurs de la pêche artisanale (FEDOPA) Killybegs Fishermen's Organisation Low Impact Fishers of Europe (LIFE) OVIS (Support Fund for Fisheries in Transition) Rederscentrale

Stakeholder category	Organisation
Fishers (3)	Croatia Ireland Latvia
Fisheries experts (13)	EqualSea Lab University of Santiago de Compostela European Market Observatory for Fisheries and Aquaculture (EUMOFA) Fisheries and Aquaculture Monitoring, Evaluation and Local Support Network (FAMENET) Fisheries Research Institute of Slovenia International Council for the Exploration of the Seas (ICES) National Institute of Aquatic Resources, Section for Ecosystem-based Marine Management, Denmark ProSea Marine Education, the Netherlands Scientific, Technical and Economic Committee for Fisheries (STECF) Thünen Institute Trinity College Dublin, Ireland University of Gothenburg University of Tartu, Estonian Marine Institute Wageningen University & Research
EU bodies (4)	CINEA DG MARE European Fisheries Control Agency

Fishers who were consulted in Phase 3

Member State	Under 12	Over 12	Men	Women	Non-fisher	Total consulted
Belgium	2	2	3	1	-	4
Bulgaria	4	4	8	-	-	8
Croatia	4	-	4	-	-	4
Cyprus	5	6	10	1	-	11
Denmark	2	2	4	-	-	4
Estonia	3	-	2	1	-	3
Finland	2	1	3	-	-	3

Member State	Under 12	Over 12	Men	Women	Non-fisher	Total consulted
France	4	1	4	1	1	6 ([33])
Germany	-	5	5	-	-	5
Greece	2	2	4	-	-	4
Ireland	1	3	4	-	-	4
Italy	3	2	4	1	-	5
Latvia	2	2	3	1	-	4
Lithuania	11	3	14	-	-	14
Malta	2	2	4	-	-	4
Netherlands	-	-	2	-	2	2
Poland	2	2	4	-	-	4
Portugal	1	1	2	-	-	2
Romania	2	2	4	-	-	4
Slovenia	3	1	4	-	-	4
Spain	3	2	5	-	-	5
Sweden	3	2	3	2	-	5

Stakeholders who participated in meetings and/or provided written feedback in Phase 3

Stakeholder category	Organisation
Social partners (1)	European Transport Workers' Federation (ETF)
Advisory Councils (8)	Baltic Sea Advisory Council Market Advisory Council Mediterranean Advisory Council Pelagic Advisory Council Northwest Waters Advisory Council Southwest Waters Advisory Council North Sea Advisory Council
Interest groups – Fisheries (2)	Dutch demersal fleet representative Rederscentrale

([33]) An additional interview was conducted with a researcher who had consulted 48 fishers in the context of a similar project with scenarios for the future.

Stakeholder category	Organisation
Fisheries experts (3)	UMR MARBEC, France Port authorities, The Netherlands
EU bodies (1)	DG MARE

Appendix 3: Megatrends impacting fisheries' long-term sustainability

Megatrend	Source	Description
Increasing significance of migration	JRC	The societal and political significance of migration has increased, and migration dynamics have become more complex in an interconnected world.
Aggravating resource scarcity	JRC	The demand for water, food, energy, land, and minerals is rising substantially, making natural resources increasingly scarce and expensive.
Increasing influence of new governing systems	JRC	Non-state actors, global conscientiousness, social media, and the internationalisation of decision-making are forming new, multi-layered governing systems.
Continuing urbanisation	JRC	People worldwide have been moving from rural to urban areas in search of better opportunities—such as jobs, services, and education—and this accelerating trend is likely to continue.
Climate change and environmental degradation	JRC	Continued anthropogenic pollution and greenhouse gas emissions will further increase changing climate patterns.
Changing nature of work	JRC	New generations entering the workforce and older generations working longer are changing employment, career models, and organisational structures.
Accelerating technological change and hyperconnectivity	JRC	Technology and digital connectivity are having a growing impact on how we live, from how we socialise and work to production and governance.
Growing consumption	JRC	The consumer class is expected to reach almost 5 billion people by 2030. This means 1.3 billion more people have increased purchasing power than today.
Expanding influence of East and South	JRC	The shift of economic power from the established Western economies and Japan towards the emerging economies in the East and South is set to continue.
Changing security paradigm	JRC	The diversification of threats, and the people behind them, are generating new challenges for the defence and security communities and society.
Ageing Population	Ipsos	The population is ageing in most countries, creating a brain drain for businesses and putting pressure on economies and social care programmes.
Increased Automation	Ipsos	Retailers and manufacturers are increasingly looking for ways that automation can support or replace employees. Automation takes many forms and will continue to proliferate.

Megatrend	Source	Description
Pressure on the middle classes	Ipsos	Middle-class incomes are becoming less influential in advanced economies, while the Asia-Pacific middle class will account for most of the global middle-class spending.
Impacts of inflation	Ipsos	Inflation remains high in most countries as the threat of a global recession looms. This has been a shock, particularly in the United States (US) and Eurozone. Global energy prices will continue to impact the economy and consumer spending.
Over-development	Ipsos	Overpopulation and over-development are existential threats to humans, who currently use 150% of the Earth's renewable ecological resources each year.
Entrenched inequality	Ipsos	Global progress in reaching pay parity between men and women has slowed down. Systemic racism has become more broadly acknowledged, and long-standing inequities are being surfaced and rectified.
Growing mental health pressures	Ipsos	There is a global increase in the prevalence of stress, anxiety and depression. People are becoming increasingly worried about topics such as climate anxiety, wellness anxiety and war anxiety.

Source: Ipsos and JRC

Appendix 4: Drivers of change behind the megatrends

Political drivers

Driver	Description
Evolving geopolitical landscape	Evolving geopolitical dynamics and their implications for EU fisheries encompass maritime security challenges, shifting power balances, and the complexities of international relations with neighbouring countries and emerging global players.
Maritime security challenges	An increasing challenge to patrol the EU's external sea borders to protect its waters, resources, and offshore infrastructure such as wind farms and cables from unauthorised entry by foreign fleets.
Expanding influence of East and South	The rising economic and social power of China and other Asian nations, and changing attitudes in former EU colonies, changing the nature of EU relations with other coastal states.
Rising significance of migration	The movement of people into the EU becoming a driver of the nature of relations between EU states, as well as between the EU and its neighbours.

Economic drivers

Driver	Description
Changing market demand and consumption patterns	Changes in the types of fish and fish products that are in demand from EU and international markets due to economic pressures, the influence of globalisation and evolving consumer preferences.
Vessel costs (investment and upkeep)	Increased expenditure on factors like vessel maintenance and fuel, reducing fishers' earnings and driving some out of business.
Pressure on the middle classes	Rising costs and stagnating wages make it harder for citizens on middle incomes to live a comfortable existence.
Impacts of inflation	Rising costs of food lead to reductions in fish consumption or focus on cheaper products.

Social drivers

Driver	Description
Interactions and conflicts with coastal communities and other coastal users	Rising demand on coastal areas leading to higher levels of conflict between fishers and other stakeholders on how coastal space is used and managed.
Fisher demographics and recruitment challenges	Ageing, remote and declining populations of fishers and problems in attracting local youth to the sector.

Driver	Description
Changing nature of work	Challenging working and safety conditions, changing expectations around work-life balance and widening opportunities in other sectors.
Continuing urbanisation	Rising city-based populations and a widening age imbalance between urban and rural areas.
Entrenched inequalities	Rising and interlinked inequality widening the gaps between different groups; especially those in urban and historically deprived areas such as coasts.
Growing mental health pressures	Rising awareness and openness around stress and anxiety at work and its impact on personal life.

Technological drivers

Driver	Description
Increasing use of (new) technologies	Increasing influence of technology and its impact on the industry. New technologies, such as AI and automation are driving greater need for investment in the fleet to reskill fishers to adapt and compete in a new labour market.
Availability and quality of scientific data	Issues around fishers' implementation of new technology for complying with new requirements on reporting catches impacting on data quality and availability.
Lack of infrastructure in some countries	The remote areas where fishers live and work acting as a barrier that slows or impedes the rollout of new technologies needed to fish in the future.
Influence of technological change on daily life	Continued increase in how technology and digital connectivity shape where, how and when fishers live and socialise.

Legal/Regulatory drivers

Driver	Description
Fishing regulations and governance	Expanding regulations to meet greater sustainability and technological requirements clashing with falling trust in policymaking due to dissatisfaction with outcomes.
Limits of public funding	Rigid and complex legal frameworks for public funding access and its impact on vessel modernisation.
Rethinking trust in institutions	Falling public trust in policy and policymakers due to dissatisfaction with outcomes and changes in public opinion.
Overdevelopment	Lack of management of resource demands in coastal areas leading to increased strain on natural ecosystems.
Entrenched inequalities	Rising and interlinked inequality widening the gaps between different groups; especially those in urban and historically deprived areas such as coasts.
Growing mental health pressures	Rising awareness and openness around stress and anxiety at work and its impact on personal life.

Environmental drivers

Driver	Description
Increasing impact of climate change on marine ecosystems	Sea-level rise, coastal degradation, increasing ocean temperature, migration of fish stocks, and ocean acidification are impacting the placement of traditional fish stocks and the locations where fishing fleets can operate.
Increasing impact of biodiversity loss in marine ecosystems	Environmental stresses leading to irreversible loss of marine and coastal biodiversity. Habitat degradation and falling species variation and numbers reduce the quality of the marine ecosystem, in turn reducing the fish available to catch.
Increasing impact of pollution on marine ecosystems	Habitat degradation and falling species variation due to eutrophication and pollution, including from plastics.
Impact of predatory species on catch and resources	Protected predatory species, such as seals and cormorants, interrupt the rebuilding of fish stocks and can lead to the spread of parasites.

Appendix 5: Overview of concrete challenges for 2050

Challenge	Description	Drivers of change behind the challenge
Fishers & Nature: competitors or collaborators?	Resource scarcity and the impacts of climate change on fishers' livelihoods collide with a greater focus on sustainability in legislation, to make some fishers feel they are in competition with the natural world. This can be driven by rising marine predator numbers, legislative pressure on traditional fishing methods, and a perception of over-protection for Endangered, Threatened and Protected (ETP) species. Fishers' behaviours in nature and their impact on the ecosystem can also be more competitive or collaborative; for instance, their interpretation of what constitutes "overfishing" may be different to the authorities who set the rules. But incentives and messaging could promote a longer-term and more sustainability-oriented relationship with nature, as well as between decision-makers, fishers, and scientists, if handled correctly.	Marine resource scarcity Climate change and coastal degradation Ecosystem condition Impact of predatory species Alternative income opportunities
Sharing congested coasts and seas	The coast, nearshore, and offshore spaces are becoming increasingly important sites for converging trends of urbanisation, immigration, geopolitics, development, and the blue economy. Demand for coastal land and marine real estate, both nearshore and offshore, will rise as a result. Greater focus on coasts and the sea will be beneficial for many fishers, but there is also a risk that they will feel they are losing out, economically and socially, to other marine priorities.	Continuing urbanisation Overdevelopment Interactions and conflicts with coastal communities and other coastal users Relations with neighbouring countries Ecosystem condition

Challenge	Description	Drivers of change behind the challenge
Building the fleet of the future	The fishing fleet will require significant investment to meet new regulatory standards (for instance, around traceability and future CFP), make the most of technological innovations, improve living standards, and support Europe's transition to Net Zero. While new regulations can enable profitable innovation for some fishers, many may struggle to provide (or prioritise) the investment required. This leads to a risk that the EU fleet is leapfrogged in technological standards and efficiency by others, including China. The education and skills required to operate vessels will also change, requiring adaptation from fishers and exposing skills bottlenecks in the marine economy. Fishers will continue to question whether the benefits of a more efficient and safer fleet in their lifetime will offset the required investment.	Influence of technological change on daily life Vessel costs (investment and upkeep) Concerns on scientific data quality Lack of infrastructure in some countries Increased automation and use of AI Climate change & coastal degradation
Drawing lines in the sea	A more fractured geopolitical environment and future EU expansion will put fishers at greater risk of being drawn into personal and international disputes over factors including fishing rights, border incursions and irregular migration. Amid geopolitical competition from Asian countries and fleets and rising "anti-western" sentiment, there is a risk of losing influence in forums like regional fisheries management organisations (RFMOs), while the Sustainable fisheries partnership agreements (SFPAs) could be at greater risk of being cancelled or not renewed. As technology improves further, there will be greater emphasis from friendly and hostile states on observing and controlling what goes on, far out into the sea. The result could be more robust control of fisheries, greater exclusion for foreign fleets – or both.	Maritime security challenges Relations with neighbouring countries Expanding influence of East and South Increasing geopolitical conflicts

Challenge	Description	Drivers of change behind the challenge
Fishing – a vocation or a business?	Fishers today are an ageing and shrinking part of the workforce, often based in locations where recruitment is already challenging. New, better-paid remote working opportunities that offer better work-life balance may increase competition further still. This could further increase the importance of non-EU workers – including those working irregularly – for fishing in many countries. How far will the culture of fishing adapt in these communities to become one which welcomes newcomers, including women, and retains fishing as a way of life? Or will fishing simply become a job, with many drawn to other, more lucrative, opportunities?	Entrenched inequalities Changing nature of work Ageing populations Growing mental health pressures Pressure on the middle classes
Surviving a 2+ degree ocean	Current projections suggest global warming will exceed the 1.5C target by some margin. This will herald significant and violent changes in the frequency of extreme weather, placement of traditional fish stocks and the locations where fishing fleets can operate. This poses severe threats to fishers' lives and livelihoods, likely driving more demands for social and economic protection. Some may find opportunity within the disruption, for instance through fishing new species that arrive in their waters. But adapting to rapidly changing waters requires greater entrepreneurialism and access to funding that will be unavailable to almost all in the sector.	Climate change and coastal degradation Ecosystem condition Marine resource scarcity Changing market demand and consumption patterns
Changing trade and tastes	EU consumer preferences are changing under the pressure of demographic factors including urbanisation, ageing, and increased economic inequality. Rising demand for sustainable and ethical fish (involving clear indications of origin), along with dwindling wild stocks, is set to outpace supply. This could drive up prices, stimulating greater interest in aquaculture, cheaper imports, and plant-based seafood for those for whom seafood becomes unaffordable. International trade will become increasingly "geopoliticised", which signals greater disruption in a highly globalised trade like seafood. Even with new trade agreements, there may be a greater role for boycotts, tariffs, and nationalistic consumer behaviour in the future trade environment, as countries seek to target support at their own fisheries.	Changing market demand and consumption patterns Impact of inflation Expanding influence of the South and East Increasing geopolitical conflicts

Challenge	Description	Drivers of change behind the challenge
Keeping up with regulation	Legislative and regulatory requirements on fishers are already significant. Environmental, technological and net zero rules might expand further over the coming decades. Fishers may react differently to these rules – some might welcome them as a certification of higher quality and environmentally sound stewardship. Others could see them as (further) impositions from distant governments that threaten to drive them out of business. Like farmers, fishers are an evocative profession that can give voice to wider social dissatisfaction at the ballot box. This becomes a more significant challenge against a broader political backdrop of weak trust in institutions and the emergence of more authoritarian governments that push at the limits of legal opposition to international rules and conventions. New approaches like co-management may be required to help fishers feel listened to within existing institutions and political systems.	Influence of new governing systems Rethinking trust in institutions Entrenched inequality Influence of technological change on daily life

Appendix 6: Final list of critical uncertainties

This is the final list of critical uncertainties decided upon by stakeholders and experts during the Phase 2 workshops ([34]).

1. **Evolving geopolitical landscape:** Evolving geopolitical dynamics and their implications for EU fisheries, encompassing maritime security challenges, shifting power balances, and the complexities of international relations with neighbouring countries and emerging global players.
2. **Vessel costs (investment and upkeep):** Increased expenditure on factors like vessel maintenance and fuel, reducing fishers' earnings and driving some out of business.
3. **Consumer and market dynamics:** Changes in overall demand for fish caught by European Union (EU) vessels operating in EU waters. Influencing factors include import competition, consumer demand, species preferences, ethical concerns, and market trends.
4. **Interactions and conflicts with coastal communities and other coastal users:** Rising demand on coastal areas leading to higher levels of conflict between fishers and other stakeholders on how coastal space is used and managed.
5. **Fisher demographics and recruitment challenges:** Ageing, remote and declining populations of fishers and problems in attracting local youth to the sector.
6. **Changing nature of work:** Challenging working and safety conditions, changing expectations around work-life balance and widening opportunities in other sectors.
7. **Increasing use of (new) technologies:** Increasing influence of technology and its impact on the industry. New technologies, such as AI and automation are driving greater need for investment in the fleet to reskill fishers to adapt and compete in a new labour market.
8. **Availability and quality of scientific data:** Issues around fishers' implementation of new technology for complying with new requirements on reporting catches impacting on data quality and availability.
9. **Climate change and fisheries resources:** Climate change and biodiversity changes impact marine ecosystems and therefore fishers'

([34]) During Workshop 3 of Phase 2 it was decided by the participants to combine the 'increasing impact of climate change and marine ecosystems' and 'increasing impact of biodiversity loss in marine ecosystems (including pollution) and rename the driver 'climate change and fisheries resources'. This is why the final list is made up of 11 drivers.

operations. Impacts include sea-level rise and ocean temperature, the state of coastal and habitat degradation and pollution, biodiversity loss, fish stock migration, and species variation.

10. **Fishing regulations and governance:** Expanding regulations to meet greater sustainability and technological requirements clashing with falling trust in policymaking due to dissatisfaction with outcomes.

11. **Limits of public funding:** Rigid and complex legal frameworks for public funding access and its impact on vessel modernisation.

Appendix 7: Key features of the profiles of future fishers

The table below provides a comparative analysis of the characteristics of fishers in the profiles of future fishers in 2050, and the drivers of change which are alluded to in the different profiles and personas.

	Sea / basin	Country	age	sex	owner / crew	Fishers numbers trend	Fleet size trend	Climate Change and ecosystems degradation	Markets demand	Geopolitical landscape	Vessel costs	Coastal conflict	Fisher demographics	Changing nature of work	New technology	Availablity and quality of data	Fishing regulations	Public funding	Widening inequality	Increasing migration	New governance systems	Continuting urbanisation	Demographic imbalances	Diversification of education and learning	Shifting health challenges
Scenario 1: moderate planetary crisis, strong demand																									
SSF profile						↓	↓	X	X		X	X	X	X	X	X		X	x		X			X	
SSF persona 1 PAULO	Atlantic (outermost region)	Azores (Portugal)	50	man	owner, polyvalent			X	X						X	X	X							X	X
SSF persona 2 MARUXA	Bay of Biscay/Iberian coast	Spain	40	woman	owner, pots			X	X				X				X				X				
LSF profile						↓	↓	X	X		X	X	X	X	X	X		X						X	
LSF persona 2 JEROEN	North Atlantic / Oceanic NE Atlantic	Netherlands	60	man	owner, corporate manager			X	X		X				X									X	
LSF persona 2 AIDEN	Celtic Sea / Atlantic	Ireland	25	man	crew			X	X				X	X	X					X				X	
Scenario 2: severe planetary crisis, strong demand																									
SSF profile						↓↓	↓↓	X	X	X	X	X	X	X	X	X	X	X	x		X			X	
SSF persona 1 ANTOINE	North Sea	France	35	man	owner, pots and fixed nets, high value demersal			X	X						X	X		X						X	
SSF persona 2 MELINA	Western Mediterraenan	Italy	40	woman	joint owner			X	X						X								X		X
LSF profile						↓↓	↓↓	X	X	X	X	X	X	X	X	X	X	X			X			X	X
LSF persona 1 GUNTHER	North Sea and external northern waters	Germany	45	man	crew			X	X	X			X	X			X								
LSF persona 1 AHMADOU	Adriatic Sea	Senegal	25	man	crew			X	X				X		X					X					
Scenario 3: moderate planetary crisis, weak demand																									
SSF profile						↓↓	↓↓	X	X		X		X	X	X	X		X	X		X	X		X	X
SSF persona 1 MATTEO	Mediterranean	Malta	40	man	owner operator, multi-gear			X	X		X		X		X			X						X	
SSF persona 2 ELENA	Black Sea	Romania	50	woman	owner, hook and line			X	X						X	X	X	X			X			X	
LSF profile						↓↓	↓↓	X	X	X		X	X		X	X		X	X	X	X			X	
LSF persona 1 MARKAS	Baltic Sea	Lithuania	40	man	crew			X	X					X	X		X							X	
LSF persona 2 IVAN	Adriatic Sea	Croatia	55	man	owner			X	X		X		X		X	X	X					X			
Scenario 4: severe planetary crisis, weak demand																									
SSF profile						↓↓↓	↓↓↓	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	
SSF persona 1 FREDERIK	North Sea	Denmark	45	man	owner			X	X			X	X	X	X		X					X	X	X	
SSF persona 2 DIMITRIOS	Ionian Sea and Central Med	Greece	60	man	owner			X	X		X		X		X	X	X	X				X	X		
LSF profile						↓↓↓	↓↓↓	X	X	X	X		X	X	X			X	X							
LSF persona 1 REMCO	North sea/English channel	Belgium	45	man	crew			X	X		X			X	X					X				X	
LSF persona 2 PAWEL	Baltic Sea	Poland	50	man	owner			X	X	X	X		X				X	X			X				

Source: Study team's own elaboration. Note: Drivers in green are the primary and secondary drivers considered as central to the future scenarios developed during Phase 3 of the study. Drivers in light blue/aqua are additional drivers of change.

Appendix 8: Lessons learned for future foresight work

Lessons learned from Phase 1

Methodology for engaging with fishers

Briefing of the country experts in preparation for the consultations with fishers in the 22 coastal Member States and outermost regions was important in standardising the approach taken to consultation and reporting, and providing an opportunity for the country experts to clarify any practical and methodological issues.

Translation of the briefing materials and questions for fishers into local languages was important in most cases.

Both KIIs and FGDs generally worked well, whether conducted in person or remotely, in elucidating fishers' feedback. Open-ended responses to pre-defined questions served their purpose in enabling a rich and wide range of information to be collected from fishers in response to the questions.

The adapted Photovoice methodology was also effective in helping to understand fishers' perceptions, as well as generating images for use in some of the study outputs and communication materials.

In some countries, it was difficult to persuade fishers to participate in consultations due to survey fatigue and/or dissatisfaction with EU institutions and/or policies, which contributed to an unwillingness or inability of fishers to engage with the country experts. In other cases, and with fishers often at sea, there were practical limitations in being able to access them for consultations. This was especially the case when trying to reach fishers remotely by phone or email to arrange consultations.

Ensuring the representativeness of fishers consulted was challenging, given the geographical scope of study, and the need to engage with fishers from different fishing metiers. While many large-scale fishers were consulted during Phase 1, there were more consultations with small-scale fishers.

The profiles of current fishers developed during Phase 1 were mistakenly taken by some stakeholders as being the future profiles of fishers, or a draft version of them, despite the explanation provided on the Commission website where they were posted that the profiles were of fishers in 2024, and not those in 2050 to be developed later in the study.

Recommendations and best practice:

- Ensure country experts tasked with fieldwork are adequately briefed.
- Ensure country experts have the language skills to engage with fishers in local languages.
- Work through representative organisations where possible (such as members of advisory councils or social partners), and if fishers are still not accessible, gather the views of those in the organisations who can be expected to have a good understanding of fishers' views.
- Time consultations for when fishers are most likely to be available and not at sea.
- Consider whether visits to fishing ports without pre-arranged consultations can be effective in accessing fishers.
- Keep a record of fishers consulted (un-named) to ensure as much representativeness as possible and to be able to demonstrate transparently fishers consulted, while preserving anonymity, as well as confidentiality.

Methodology for engaging with other EU fisheries stakeholders

A key lesson learned from this study was that ensuring that various groups of stakeholders feel represented in foresight exercises is essential for comprehensive input. Moreover, communicating foresight methodology/approach/objectives effectively to stakeholders requires clear and ongoing explanations.

The study's kick-off event reinforced that some stakeholders struggled to fully grasp foresight's purpose and methodologies, despite our best efforts to clarify. This challenge, which is addressed in greater detail in the next section, underscored the importance of being transparent and developing effective messages to make the foresight process more accessible, both in terms of language and content.

The kick-off event also provided a valuable opportunity to anticipate questions and concerns that may arise during the development of the future scenarios and fisher profiles. Key points included stakeholder expectations for a balanced representation across vessel sizes, sea basins, gender perspectives, and positive or negative depictions of various fisher profiles. These insights informed our approach for the phases of the study, emphasizing the need for inclusivity and sensitivity in designing scenarios and profiles that resonate with all stakeholder groups.

Potential actions:

- Develop tailored communication materials such as infographics, videos, and factsheets, to explain the foresight process in clear and relatable terms.
- Envisage short, focused sessions to introduce the foresight methodology and answer stakeholders' questions before formal consultations.

- Provide regular updates and clarifications, for example using newsletters or email updates with an overview of the study's progress, addressing common questions and/or including short explanations of key concepts.
- Consider multilingual access and simplified language in communication materials, as well as in study deliverables that require stakeholder input.
- For key groups such as Advisory Councils or Social Partners, consider more personalised approaches that can foster deeper understanding and trust (e.g. by offering individual/group briefing/consultation sessions as those organised in Phase 3 of the study).

Overall reflections

The use of multiple methods was important in generating an evidence base to be used to set the scene, which was the main objective of Phase 1. Background literature at Member State and EU level on the fisheries sector, a review of documentation on topics/drivers of change and policies, and consultations with fishers and other stakeholders using various tools and materials provided a rich array of information.

Lessons learned from Phase 2

Future-focused thinking

Many participants who engaged in our consultation activities struggled to envision the future, often focusing instead on current challenges and organisational interests rather than neutral expertise of the field that could help build a vision of the future. This was particularly challenging for those acting as representatives of fishers and their member organisations.

Recommendations and best practice:

- Provide more context and support, offering additional pre-workshop materials or activities to help participants familiarise themselves with the concept of scenario building and its long-term value.
- Prepare a careful assessment of participants, including previous experience with foresight.

Comfort level with scenario building methodology

Participants often struggled to grasp the theoretical exercise of building axes of uncertainty and extremes. Participants were more comfortable once presented with draft scenarios to discuss and debate.

Recommendations and best practice:

- Focus external participation on concrete deliverables. If participation is required on more technical/theoretical aspects, **careful selection of participants and building of understanding over successive days** is a pre-requisite. In-person meetings are also particularly beneficial in this case.
- Clarify expectations in relation to participants' contributions. Emphasise that their contributions are valuable regardless of their background, and that diverse viewpoints are essential for robust scenario development.

External perspectives

While external voices were sought, attendance was relatively limited in some of the strategic workshops.

Recommendations and best practice:

- Give more advance warning of the timing of workshops and stick to set dates.
- Revisit invitation strategies, personalise invitations, highlight the unique value external participants bring to the discussion.
- Explore incentives, for instance by offer honoraria or other incentives to encourage participation.
- Publicise study more broadly and raise awareness to attract a wider pool of participants.

Engagement with draft content

Participants demonstrated increased engagement and understanding when draft content was shared with them before the workshops.

Recommendations and best practice:

- Share preliminary material in advance to the discussions. Provide participants with access to early drafts of the deliverables or materials to stimulate participation and inform their contributions.

Axes of uncertainty task

Limited time constrained in-depth exploration of the matrices in some workshops.

Recommendations and best practice:

- Allocate more time for certain activities to ensure ample time for participants to fully engage with the matrices and explore potential scenarios.

- Provide more guidance and support by offering more detailed instructions and examples to help participants understand and apply the axes of uncertainty framework.

Applying the uncertainty dimension

Some participants struggled to differentiate between whether an event was uncertain to occur, versus the uncertainty surrounding the outcomes of that event if it did occur for EU fishers.

Recommendations and best practice:

- Provide clearer definitions and examples to illustrate the difference between uncertainty of occurrence and uncertainty of impact.
- Use real-world examples relevant to the industry to help participants grasp the concept.

Mixed stakeholder groups and grievance airing

The diversity of stakeholders and their differing perspectives presented challenges, with some using the workshops to express grievances.

Recommendations and best practice:

- Set clear expectations and ground rules. Establish a respectful and constructive atmosphere from the outset, emphasising the focus on future scenarios rather than past or current grievances.
- Moderate discussions effectively. Intervene when necessary to redirect conversations and keep participants focused on the workshop objectives.

Overall reflection

The first workshops underscored the critical role of clear communication, thorough participant preparation, and adaptability in navigating diverse perspectives and varying levels of familiarity with foresight methodologies. To ensure continued success, ongoing attention to participant selection, preparation, and facilitation strategies proved to be essential.

Lessons learned from Phase 3

Drafting profiles

The study team worked in an iterative manner with DG MARE during the initial drafting process. This required regular engagement and responsiveness by both parties in commenting/editing on draft versions of text. This process worked well and was important in ensuring that DG MARE was sufficiently involved, that the study team benefited from the expertise of DG MARE staff, and that the organisational views of the Commission were adequately reflected in the draft profiles which were the basis of stakeholder feedback.

Recommendations and best practice:

- Set clear timeframes for action by the study team and DG MARE so that collaboration can be ensured when working in a collaborative and iterative manner.

Consultations on the profiles

The offer to ACs/SPs of participating in one of several consultation workshops held on different dates facilitated satisfactory attendance, and thus feedback. A series of early notice and reminders about upcoming consultations and sharing the documentation on the scenarios and the profiles to ACs/SPs well in advance (three weeks, and after the summer holiday period) enabled participants to come well prepared to the consultation workshops. The workshop duration (three hours) was found to be appropriate. Allowing a four-week window for ACs/SPs to submit feedback in writing gave them the opportunity to consult further their members and generated additional feedback for the study team.

The above arrangements allowed for many useful comments to be made during the workshops and in written form, and for participants to express their views. Participants had clearly read the documentation prior to the workshops which saved time.

Consultations with fishers in the 22 coastal Member States and outermost regions proved to be challenging for many of the same reasons as during Phase 1. But additionally, it was difficult for the country experts to quickly summarise all the information in the scenarios and profiles, and unrealistic to expect fishers to read through long documents prior to the consultations.

During the consultations with fishers, many preferred to comment on current issues or made comments about what they would want for the future, rather than providing comments on the draft profiles themselves and their logic. That said, many detailed comments on the profiles were provided based on the lived

experiences of fishers, which were very helpful in improving the future profiles to increase their plausibility.

Recommendations and best practice:

- Clearly explain the timetable and mechanisms for consultations with ACs/SPs well in advance of them taking place.
- Provide workshop documentation to participants in advance to allow time for review by participants, thereby saving time during workshops.
- Allow for oral and written feedback to ensure as broad participation in the consultation process as possible.
- Do not rely on feedback from only fishers 'on the ground' but revert to ACs/SPs as well.

Finalising the profiles

The systematic addressing of all the comments noted by the study team was a thorough and rigorous process that allowed the study team to demonstrate that all comments had been considered during the final drafting of the future profiles. The involvement of DG MARE in the review of the approach to addressing the comments received and the modifications to the text of the profiles consequently, further strengthened the robustness and transparency of the approach. Acknowledging ACs/SPs' feedback and outlining how aspects had been included in the revised text reinforced the stakeholder-based approach of the study.

Recommendations and best practice:

- Ensure detailed and transparent consideration of stakeholder feedback on draft outputs, so that comments can be used to improve the quality of final project deliverables and the study team can demonstrate accountability.
- Acknowledge and thank those providing feedback during consultations and explain how the feedback has been used.

Overall reflections

Meaningful consultation is a complicated and demanding process for both stakeholders and study teams, especially when feedback is sought on lengthy documents and studies involve approaches, such as foresight, which are new to stakeholders. Despite the consultative processes adopted and the positive views expressed by many stakeholders about the profiles and their plausibility, it was difficult for some to consider the logic of the profiles and their purpose. Many stakeholders felt that the profiles they were asked to comment on were too general in nature. This was a result of a failure to recognise that it is not possible for the profiles to cover all the intricacies, nuances and differences of fishers in the EU given the wide range of individual fishers, fishing metiers and the different

sea basins. While it was tempting for the study team to introduce text referring to specific fleet types, countries or sea basins, this was resisted as it would have raised questions about why other fleets, countries and sea basins were not mentioned. Efforts had to be made throughout the study to explain to stakeholders that the profiles serve to provide the main headline trends, from which further work and future analysis can reflect on more specific circumstances.

Lessons learned on project management and communication activities

The management of this study highlighted the importance of adaptability, strategic collaboration, and proactive budget management.

Flexibility of the study team and DG MARE was essential in adapting to unforeseen needs that emerged as the study progressed. For instance, the study team organised an additional workshop to clarify and gather input on the main drivers of change for the future scenarios. Similarly, we extended engagement by organising consultations in Phase 3 with ACs/SPs, recognising their importance to the study's relevance and impact. We also supported DG MARE by attending the European Maritime Day 2024 in Svendborg, Denmark, contributing to the study's website, and organising a hybrid and larger than planned closing event. These actions, while beyond the original scope, added substantial value and demonstrated the importance of being responsive to the study's evolving needs.

Some challenges emerged during the first stages of the study around the communication elements of the study. The study's visual identity, messaging, and expectations around communication deliverables lacked early definition. This resulted in some initial uncertainties around visual and content standards, which required extra coordination and adjustments to ensure that communication outputs met expectations. Given the essential role that communication and stakeholder engagement play in a foresight study, it is vital to recognise it is not only a research project but also a communication exercise requiring a well-defined visual identity and clear messaging strategies. Hence, early engagement of the communication team in the study is beneficial.

Another challenge encountered was related to the video and social media content generated. Much of the collected footage and photos predominantly reflected the current challenges faced by fishers, portraying a negative narrative that lacked a forward-looking perspective. This focus on present difficulties made the material less suitable for effectively communicating on the future of EU fisheries. As a result, the decision was made to prioritise other communication and engagement activities that better aligned with the study's objectives, for example, the scenario planning workshops and the study's closing event, which offered more constructive platforms to discuss the future of fisheries and engage stakeholders in meaningful dialogue.

In terms of budget management, the foresight study was resource-intensive due to the complexity of methodologies and the need for in-depth stakeholder engagement. Managing a very tight budget required strategic prioritisation and creative solutions, such as leveraging existing platforms and materials, to maximize outreach and maintain quality within financial constraints.

Last, the regular progress meetings played a fundamental role in strengthening the study's outcomes. Regular progress meetings provided a platform for feedback, clarification, and real-time course corrections, which allowed us to refine our approach as new challenges and needs emerged. DG MARE and the Steering Committee's input guided methodological adjustments, enhancing the robustness and adaptability of the study process.

Recommendations and best practice:

- Build flexibility into the project scope and budget from the outset to allow for additional activities that may become necessary as the study evolves (e.g. options for additional workshops, consultations, or expanded events).
- Ensure early and ongoing involvement of the communication team, ideally during the drafting of the Terms of Reference, to clarify expectations for the study's visual identity, key messages, and deliverables.
- Advocate for higher budgets for foresight studies, taking into account the resource-intensive nature of stakeholder engagement, methodology development, and communication activities.
- Use resources strategically by leveraging existing platforms, materials, and networks to maximize outreach within budget constraints.
- Plan for regular progress meetings for real-time feedback, clarification, and course correction.

Establish a structured process to capture and document stakeholder feedback, with follow-up to show how their input was used.

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