



FINFISH AQUACULTURE SECTOR PLAN

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SEPA has a strong track record of regulating to improve the Scottish environment. We are proud of what we have achieved since we were set up just over two decades ago in 1996. We know we need to do more over the next two decades to build on this success. Much more.

The mounting scientific evidence about climate change, plastics in our oceans, the pressure on our freshwater and more shows us that humanity must rise to tackle major environmental challenges. This scientific knowledge underpins SEPA's strategy for how we will regulate - One Planet Prosperity. If everyone in the world lived as we do in Scotland, we would need three planets. There is only one.

So, we will regulate to help Scotland prosper within the means of our one planet. Successful businesses in future will be those that use low amounts of water, materials and carbon-based energy and create little waste. Prosperous societies will be comprised of these businesses. This can be Scotland.

In every sector we regulate, this means we will have two simple aims:

1. we will ensure that every regulated business fully meets their compliance obligations; and
2. as many regulated businesses as possible will go beyond the compliance standards.

This draft sector plan outlines how we propose to do this in regulating the finfish aquaculture sector. Compared to many industries that SEPA regulates, finfish aquaculture is still a relatively new sector which operates at scale in only a handful of nations. Much of the science about the environmental impact of the sector is complicated and, unlike industrial facilities, there are no stacks and pipes that make measurement of discharges easy. It is a sector that attracts diverse views ranging from strong support to strident opposition.

In preparing this draft sector plan, SEPA has undertaken more scientific analysis, done more thorough thinking and held more discussions with stakeholders than ever before. We are determined to set the best and most up-to-date framework for regulating this sector. The draft plan outlines enhanced standards for organic waste and a strengthened approach for licensing medicines. The plan also details strengthened monitoring and assessment processes and a more comprehensive approach to ensuring fish farm operators comply with all these requirements.

This draft plan is ambitious. It spells out how we will use traditional environmental protection agency (EPA) regulatory tools, such as permits and enforcement, in clearer and more powerful ways. It sets out some completely new ways, such as novel partnerships, that we will develop and use to support innovation in this sector.

We would love to hear what you think of our draft plan. Once it's finalised, we are going to push on and implement it. So if you think we've got something wrong, missed something out or not been as transparent as possible, please let us know your thoughts. We want to get this right and then get on with it.

Terry A'Hearn
SEPA Chief Executive Officer



1. Introduction

For SEPA to help create a prosperous Scotland that lives within the means of our one planet, we need to radically change the way we work. In the past our approach to regulation has been grounded in the different sets of rules we manage to protect the environment. This has helped us to deliver, for example, improvements in water quality. However, it will not enable us to make the transformational changes needed to tackle today's problems.

So, we are moving instead to ground our regulation in working across whole sectors. In this way we can systematically identify the compliance issues that need to be tackled by the sector. We can also identify where the biggest opportunities are for us to help the sector to go beyond compliance. In both ways this will help regulated businesses operate successfully within the means of one planet.

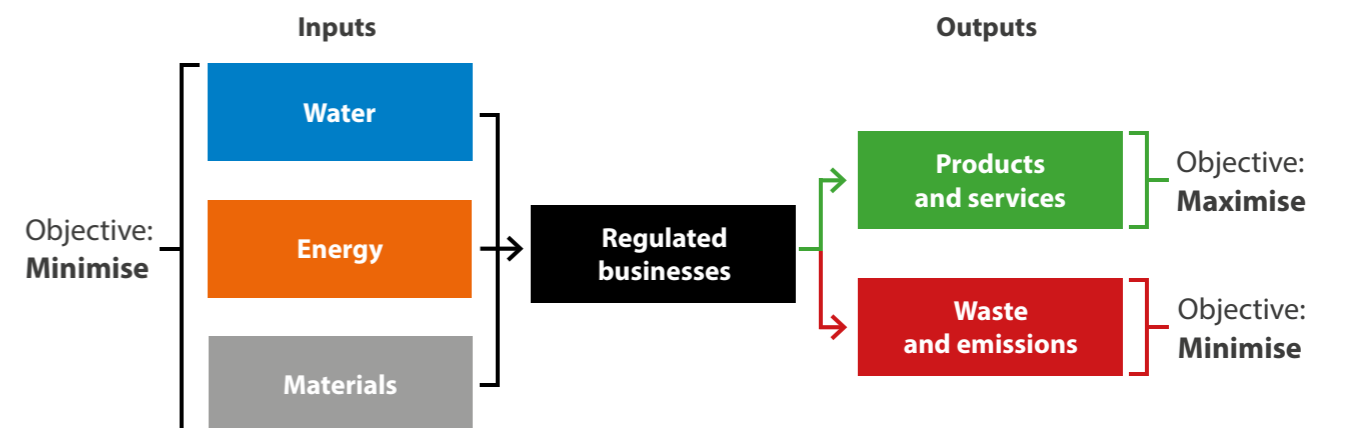
All businesses that we regulate in a sector use water, energy and raw materials to produce the products and services they sell. In doing so, they also create waste and emissions. We can think of these as environmental flows that need to be managed by the business (Figure 1).

We want to help as many businesses as possible to manage these flows effectively and reduce their use of natural resources and creation of waste in ways that enable them to meet their legal obligations, drive further improvements and operate their business successfully. To do this, we are preparing sector plans for every sector that we regulate.

Sector plans are at the heart of everything we do, shaping the interactions with every sector and the businesses in them. Through them, operators will get the relationship that their attitude and performance earns. Those that demonstrate a commitment to good environmental performance and deliver solid outcomes will receive powerful support through guidance and advice. Those that demonstrate behaviour which leads to significant or chronic non-compliance can expect SEPA to use the most appropriate enforcement tools to bring them into compliance.

This is our proposed plan for the finfish aquaculture sector. It details how SEPA is going to regulate the sector and work with it to protect and improve the environment. This plan, while considering all aspects of the sector, will place a particular focus on those areas where there is a poor compliance record. It is those areas, primarily the cage farms within this sector, which face the biggest challenges and stand to make the biggest gains in environmental performance.

Environmental flows (Figure 1)





2. Our vision for the finfish aquaculture sector

The Scottish finfish aquaculture sector recognises that protecting the environment is fundamental to its success and is foremost in all its plans and operations.

The sector is a world-leading innovator of ways to minimise the environmental footprint of food production and supply.

The sector has a strong and positive relationship with neighbouring users of the environment and the communities in which it operates. It is valued nationally for its contribution to achieving global food supply.

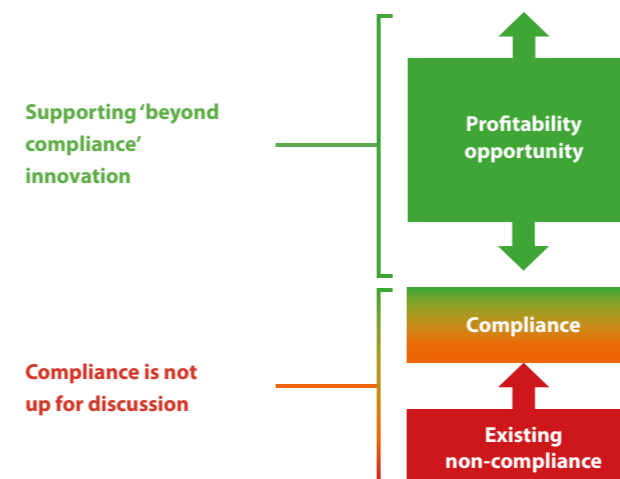
Our objectives

The objectives of the Finfish Aquaculture Sector Plan are to:

- ensure all operators in the sector reach and maintain full compliance with Scotland's environment protection laws; and
- help as many operators as possible in the sector to move beyond compliance.

This is illustrated by the sustainable economy diagram (Figure 2):

A sustainable economy (Figure 2)



This sector plan sets out how SEPA will work with the finfish aquaculture sector. To achieve our objectives SEPA staff will work with partners and facilitate liaison between them and the finfish aquaculture sector to create opportunities that link business success with environmental success.

We want to bring together skilled, experienced and innovative people from across the sector to understand key challenges and opportunities to create innovative solutions. If we get this right, it will mean that the environment is not seen as a constraint, but a platform on which economic and social success can be built, putting the finfish aquaculture sector on a pathway to becoming a "one planet" sector.



3. The finfish aquaculture sector

In recent years finfish aquaculture has become an important source of animal protein as wild fish stocks have declined and yield from capture fisheries (fish caught in the wild for consumption) remained static. Globally, aquaculture (fish and shellfish grown in farm conditions) now provides more food for human consumption than capture fisheries and under certain circumstances could reduce the pressure on capture fisheries to provide fish for human consumption.

Scotland is the largest Atlantic salmon aquaculture producer in the European Union and third in the world after Norway and Chile. A contributing factor to this is Scotland's combination of unindustrialised, sheltered sea lochs and abundant freshwater resources.

The wide variety of activities and location of feed mills, farms, processing plants and support services means that the sector supports employment in rural areas where farms are located and also in deprived urban areas where the majority of the processing is located.

Scotland's reputation for a high quality environment, our regulatory regime and the sector wide adoption of a code of good practice for finfish aquaculture has also led to Scottish produce attracting a price premium compared with other nations' finfish products. The majority of finfish products produced in Scotland are exported from the UK, primarily to USA (34%), France (23%) and China (12%).

With changes in technology and farm sizes the sector has undergone a period of consolidation from 69 salmon producing companies in 1995 to 16 companies operating in 2016. The Scottish

aquaculture industry has clearly articulated highly ambitious future growth targets for the development of the industry over the short to medium term, with the industry projecting that annual production of 300-400kt of fish may be possible by 2030.

The sector has attracted criticism over farming practices which has been reported in mainstream media and there are several organisations who oppose the industry or challenge its ability to grow without detriment to the environment, communities and fish welfare.

In the immediate future the development of the sector will be heavily influenced by stakeholder acceptability, regulation and environmental protection. Climate change and in particular increasing sea surface temperatures, ocean acidification and extreme weather are likely to become more significant to the development of aquaculture.

Fish production in the sector is currently dominated by Atlantic salmon and rainbow trout; other species of trout are farmed to a lesser extent and in previous years cod and halibut have also been farmed.

Annual production Atlantic salmon production (tonnes)			
2014	2015	2016	2017
179,002	171,722	162,817	177,202
Annual rainbow trout production (tonnes)			
2014	2015	2016	2017
5,882	8,588	8,096	7,208

Facts and figures (Figure 3)



Scottish jobs supported by the sector
10,000



Sectors contribution to Scotland's economy
£620 million



Export sales
£500 million

Supply chain of the finfish aquaculture sector (Figure 4)

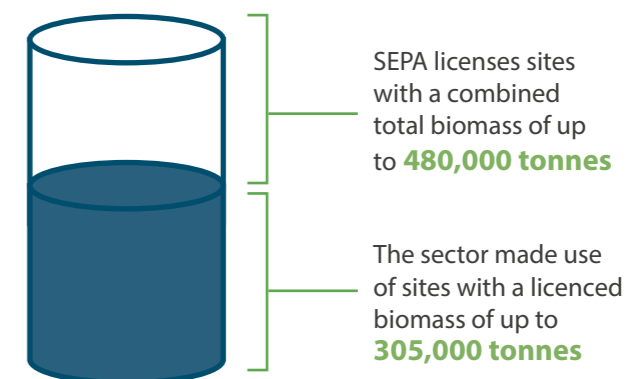
Ingredients, feed and raw materials	<p>Feed production: This has traditionally been sourced from other, less valuable fish that may have been caught from the wild. This provides protein for the farmed fish to eat but has the potential to damage wild fish stocks. Increasingly this is being substituted by vegetable proteins. Feed factories which supply Scotland are based across the globe although there are a small number of feed plants located in Scotland. For those based in Scotland, much of the ingredients and materials are imported from abroad by boat.</p> <p>Eggs: Known as “Ova”, these are sourced both domestically and imported from abroad and supply the hatcheries and farms in Scotland.</p> <p>Medicines: Medicines are developed and produced at a number of facilities across the globe and often by large pharmaceutical companies. In some cases medicines are incorporated into feed at feed mills in Scotland and administered to salmon in their feed.</p>
Freshwater (juvenile) growth stage	<p>Hatchery: The freshwater stages of production starts in hatchery premises where operators hatch and rear young salmon or trout for growing either at sea or freshwater sites. Hatcheries are often operated by small independent producers who then supply the rest of the sector although some larger companies operate their own.</p> <p>Marine hatcheries are also used to rear cleaner fish such as wrasse or lumpfish – these are fish introduced to the cages and pens to eat parasites that could damage the salmon or trout.</p>
Freshwater (adult) growth stage	<p>Freshwater stage: Freshwater aquaculture is carried out in cages in lochs, on land in tank-based systems or using rearing ponds. The majority of production from freshwater finfish farms is comprised of rainbow trout or young Atlantic salmon up to the “smolt” (10 – 15 months) stage of its growth.</p> <p>Freshwater farms are often operated by small independent producers, including those supplying trout for market. Some larger marine cage farming companies also grow smolts which are then moved to the marine (adult) growth stage.</p>
Smoltification Marine (adult) growth stage	<p>Marine stage: Marine farms are situated in the north and west of Scotland and mainly focus on Atlantic salmon production in cage farms. They are normally positioned in sea lochs, voes and bays where some shelter is provided from the worst of the weather. Increasingly, more exposed locations are being utilised. The operators use specially designed “wellboats” to move the mature fish back to land for onward transport to processing.</p>
Occurs throughout production	<p>Supporting industries: There is a broad variety of companies supporting the sector in Scotland. They include infrastructure supply companies, boat builders and construction companies. Service providers include veterinary and environmental consultancies as well as remote sensing, software and modelling. Transport providers are employed at all stages e.g. feed, smolt transport, processing, fish produce and mortalities.</p> <p>Waste management facilities: Specialist contractors are used to handle wastes and by-products from the various stages of production including sludge from feed production, hatcheries, mortalities and redundant equipment. These include ensiling wastes for further processing to the recovery of energy by digestion and energy from waste plants. Operators of these facilities tend to be independent to the producers.</p>
Market and distribution	<p>Product to market: The final products are then packaged and transported by refrigerated air, sea and land to retailers, restaurants and outlets both in the UK and globally.</p>

Biomass: used and un-used

The industry in Scotland is currently licensed to farm more fish than it currently chooses to. This means that there are locations with licences for fish farms where no activity is taking place. These empty, vacant sites exist for a number of reasons such as:

- the licence was granted but the operator later found that the location was unsuitable for farming;
- legacy sites where the operator has moved on or has not transferred it to another operator to be used;
- fallow sites; and
- sites within an operator’s portfolio that are set aside for purposes of resilience.

Biomass (Figure 5)

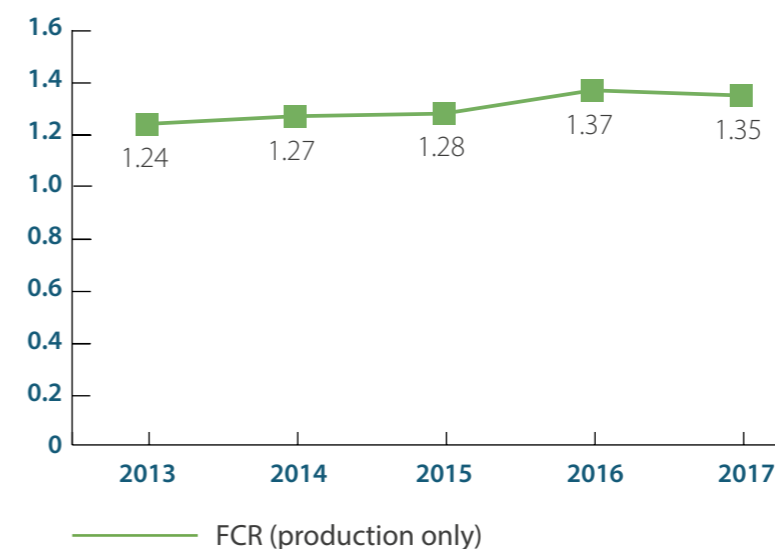


Feed to fish conversion ratio

Feed expenses typically represent 50 – 60% of the operating costs of a finfish farm and the majority of energy costs in the supply chain are linked to the capture, production and distribution of feed.

The feed conversion ratio (FCR) is the ratio between feed given and fish weight gain and is an indicator of how effective a feed strategy can be and how much feed may be going to waste in a fish farm. The ideal FCR for fish farms in Scotland for both the sector and the environment would be 1:1.

Feed to fish conversion ratio* (Figure 6)



* This excludes the reported weight of mortalities. 2017 data estimated based on incomplete dataset. FCR based on production figures from Scottish Government production surveys and data returns from finfish sector including both mortalities and feed input data.

These figures show the relationship between weight of feed input and the whole, wet weight of the fish prior to processing. This should not be compared with industry figures on “fish in:fish out”.

4. Environmental interactions and how we manage them

The finfish aquaculture sector is complex with multiple processes depending on what fish are being grown and where the sites are located. There are a number of environmental factors that can influence the sector and a number of interactions that the

sector has with its environment. Consequently there are several activities that SEPA regulates the sector on through a variety of regulations. There are also activities regulated by other agencies. Figure 7 indicates the interactions and the principle regulators:

Interactions and regulators (Figure 7)

	Finfish aquaculture sector	Environmental factors – affecting the sectors operations:	Pressures on the environment as a result of the sectors operations:	Principal regulatory authorities
Inputs and Raw Materials	Feed Cleaner fish Medicines Infrastructure materials, including plastics ↓	Sustainability of sources of omega 3 oil and cleaner fish Development of resistance to medicines	Locally regulated interactions: <ul style="list-style-type: none"> Emissions from feed, medicine and infrastructure manufacture Other interactions: <ul style="list-style-type: none"> Fisheries for cleaner fish and fish sources of omega 3 oil Fossil fuel emissions from transport and manufacturing 	SEPA Local authorities
Different types of fish farming activities	Juvenile growth stage (freshwater) ↓ Transfer to sea (salmon and sea trout only) ↓ Adult growth stage ↓	Freshwater quality and availability Capacity of environment to accommodate emissions Disease outbreaks Predators accessing cages Escapes of stock due to storm damage Activities of other uses of the environment	Locally regulated interactions: <ul style="list-style-type: none"> Emissions of organic wastes, medicines, Copper, other chemicals and nutrients** Abstraction and impoundment of freshwater Disposal of mortalities Disposal of solid waste Risk to wild salmon and sea trout from sea lice Other interactions: <ul style="list-style-type: none"> Farmed fish escapes Interaction with the interests of other users of the environment Fossil fuel emissions Plastics emissions from infrastructure wear 	Marine Scotland SEPA Local authorities Animal & Plant Health Authority (APHA) <i>Veterinary Medicines Directorate</i> <i>Crown Estate</i> <i>Scottish Natural Heritage</i> <i>**denote the key issues which drive non-compliance with environmental permits</i>
Other activities connected to aquaculture	Processing & added value ↓ Marketing & distribution	Capacity of environment to assimilate emissions and waste from processing operations	Locally regulated interactions: <ul style="list-style-type: none"> Emissions to air and water from processing operations Disposals of solid waste from processing Disposal of waste packaging Other interactions: <ul style="list-style-type: none"> Storage and management of materials Fossil fuel emissions from transport 	SEPA Local authorities



Environmental regulation of the finfish aquaculture sector

SEPA's role as regulator

There are several bodies which regulate the finfish aquaculture sector in Scotland, such as Marine Scotland through marine licenses and aquaculture production business (APB) authorisations, The Crown Estate through seabed leasing and local authorities through planning regimes.

SEPA regulates the sector at different stages using our Controlled Activities Regulations (CAR), Pollution Prevention & Control (PPC) and Waste Management Licensing (WML) regimes to protect the environment. Under these regimes, SEPA is the principle regulator for abstractions from and discharges to the water environment, emissions to air from prescribed processes and waste management on land in the sector.

Through these regimes, and working with the other regulators, SEPA aims to protect and improve the environment in the following ways:

1. Matching production to environmental capacity

The capacity of different parts of the water environment to accommodate fish farm development differs. We need to ensure that fish farming businesses look at the most environmentally suitable locations in their development planning. Our planning consultee, licensing and modelling teams work with operators, local authorities, Marine Scotland and Scottish Natural Heritage to ensure sites are suitably located.

2. Increasing the capture and beneficial use of waste

Reducing pressure on the environment and re-using waste materials wherever possible are key to One Planet Prosperity. A transition to innovative farming systems that reduce pressure on the environment by capturing and making beneficial use of waste is essential. SEPA's aquaculture specialists and circular economy team work with industry leaders and others to drive forward this innovation.

3. Minimisation of medicine and chemical releases into the environment

It is important that the industry finds ways of ensuring that the quantity of medicine residues discharged into the environment is minimised over time. SEPA's scientific teams and aquaculture specialists have been working with the industry and other regulators, especially Marine Scotland, who lead on fish health to find ways to reduce infection, disease and parasite risks while allowing the capture and treatment of medicine residues.

4. Strengthening the evidence base

Continually strengthening the evidence base on the environmental effects, and performance, of fish farms is important to enable the right decisions. SEPA does this in three ways:

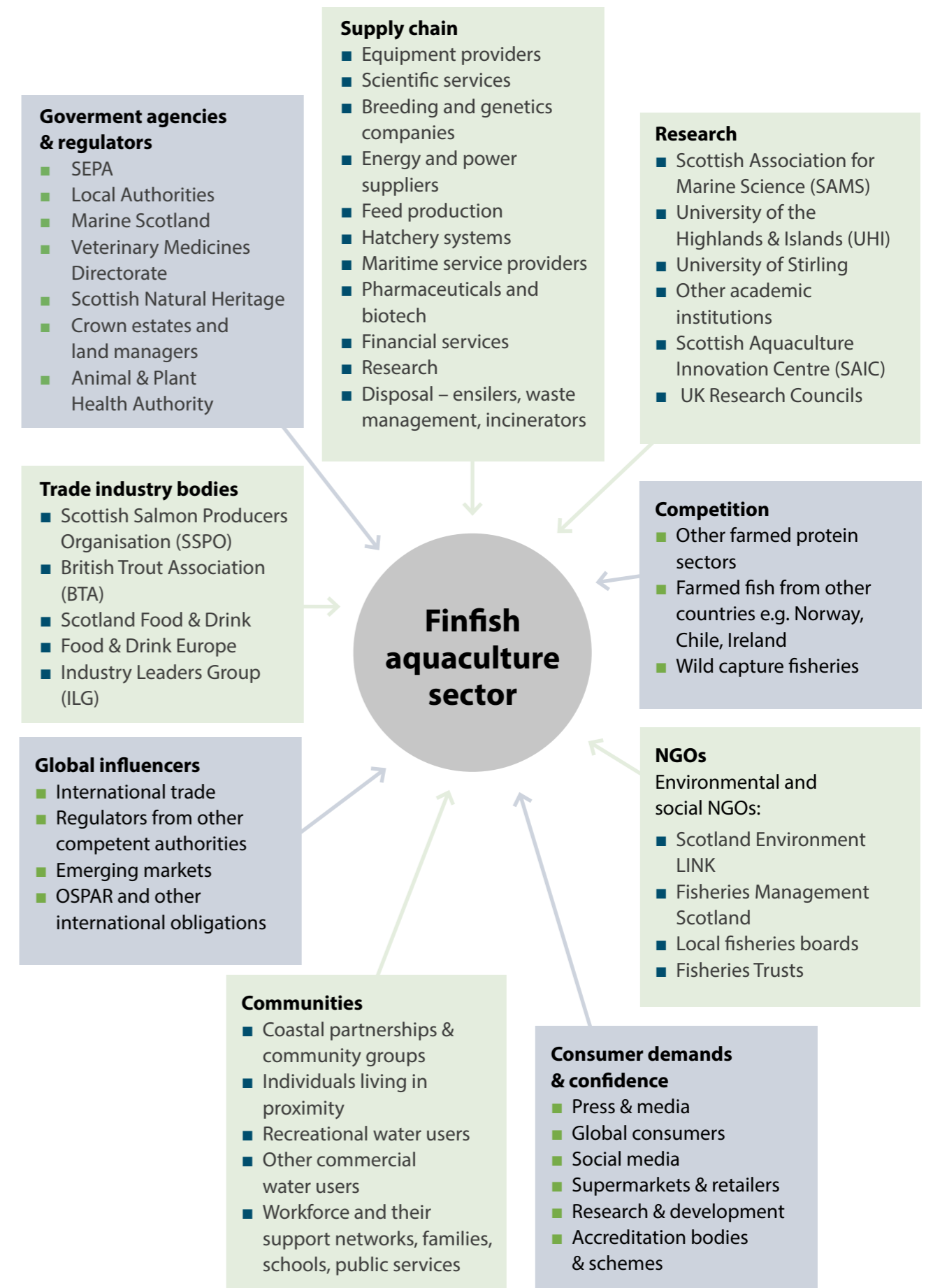
- auditing information and monitoring results provided by fish farm operators;
- routine monitoring, model development and investigative surveys; and
- promoting and supporting innovation, including collaboration with universities, research institutes and public body partners. Examples include: supporting a project with Crown Estates and others investigating the potential to extract value from aquaculture wastes. In another, SEPA is contributing to the development of novel, eDNA monitoring techniques to rapidly assess seabed conditions.

Wider influences on environmental performance of the finfish aquaculture sector

Full compliance with environmental regulations will not, by itself, deliver the transformational change required to secure our One Planet Prosperity objectives. The Finfish Aquaculture Sector Plan needs to unlock the potential for businesses to gain strengths in resource efficiency and environmental innovation. We need therefore to combine the actions that we can take to influence the behaviour of a business through our regulatory role with all the other influences. Doing this will be the most effective way to secure full compliance and to help as many businesses as possible to move beyond compliance.

Working with the sector, we will place this more sophisticated way of operating at the heart of our work. Figure 8 summarises the main organisations that influence and are influenced by operators in the finfish aquaculture sector and identifies those that we are likely to work with in both the short and longer term. As we implement the plan we will consider the opportunities these relationships provide and how we would like them to develop.

Key influences on the aquaculture sector (Figure 8)





5. Tackling non-compliance and taking opportunities to go beyond

We believe that those societies and economies that are low in resource use, specifically low in energy use, low in water use and low in waste production, will be the most successful in the 21st century. Businesses that are the most innovative will best rise to the challenges of our time, such as over use of resources and climate change and create sustainable economic growth.

To do this, every business must reach full compliance with environmental laws. But mere compliance and small-scale incremental change will not be enough. At SEPA we want to help businesses and sectors to implement successful innovation and support them in their ambitions to do more than they are required to by regulation.

We call this “moving beyond compliance”: helping already high performing businesses to do more for the environment because it makes sense for them to grow in a sustainable manner.

For the finfish aquaculture sector, going beyond compliance and improving environmental performance will help bring better reputation and increased consumer confidence along with produce sourced from a higher quality environment. This stands to benefit those businesses in the sector who pursue these opportunities.

Compliance in the sector

Compliance with environmental law is non-negotiable and regulated businesses in the sector need to comply.

The majority of permitted sites in the sector operate in compliance with environmental regulations enforced by SEPA (Figure 9). This is notable with feed plants, hatcheries and tank farms as well as sites regulated under the waste management licencing and pollution prevention and control regimes. There are examples where SEPA recognises the sector is going beyond compliance.

Pollution from marine cage fish farms is currently assessed against site specific thresholds modelled prior to authorisation (and based on information at the time of the application). In some cases the location and extent of pollution from the operation of a farm is found to vary enough, from the modelled conditions, to be non-compliant with those conditions.

We know that we can now better match sites to the environment in which they are operated by using more powerful modelling together with advances SEPA has made in understanding seabed environments.

The actions set out in this sector plan identify how SEPA, working with partners, will address non-compliances, reduce pollution and strengthen our regulatory framework. Our actions will focus initially on strengthening our regulatory framework for controlling discharges from marine cage fish farms (See Annex 1). We will also play our part with Marine Scotland, the lead agency for wild fish in Scotland, as one of a number of other regulators, NGOs, research organisations, academia and sector businesses to improve understanding of where the effect of marine cage salmon farms on sea lice abundance in coastal waters is likely to be contributing significantly to impacts on wild salmon and sea trout populations. This will assist Marine Scotland in developing improved strategies for effectively mitigating impacts.

Around 80% of environmental legislation in Scotland originates from the European Union. As the UK leaves the EU, changes will, where necessary, be made to domestic legislation to ensure that the standards of environmental protection we enjoy today and the principles upon which they are based are maintained. Therefore, while some of the detail of the legislation we use to regulate may change, our work to protect Scotland's environment will not. Our commitment to tackling non-compliance with environmental laws and, where necessary, taking enforcement action will not diminish as a result of the UK leaving the EU.

Risks to wild fish

Wild salmon and sea trout are iconic species and important elements of Scotland's biodiversity. They also provide substantial social and economic benefits, primarily through recreational angling.

The population of Scottish Atlantic salmon has declined by more than 50%, from around 1.25 million in the 1960s to around 600,000 in 2016. Significant declines in adult sea trout numbers have also been widely reported.

Survival of Atlantic salmon during the marine migration phase of their lifecycle has fallen over the last 40 years from up to around 25% survival to less than 5% currently. The causes of losses at sea are not fully understood and likely to be due to a range of factors.

Given the importance of trying to improve marine survival where possible, the Scottish Government has established an Interactions Working Group. The first workstream for this group will focus on the interaction between farmed and wild salmon and sea trout. The Working Group includes representatives of wild fisheries interests, environmental organisations, the aquaculture sector, local authorities, Scottish Natural Heritage, Marine Scotland and SEPA.

There is increasing evidence internationally indicating that sea lice abundance in coastal waters can be greatly elevated where open net salmon farming takes place; and that high abundances of sea lice can contribute to some of the losses of wild salmon and sea trout at sea.

We will work closely with Marine Scotland, other public bodies and the Interactions Working Group to help develop proposals for a new and risk-based framework for assessing and managing interactions between marine cage fish farming; sea lice numbers; and wild salmon and sea trout. Among other things, the framework will consider how, and in what circumstances, our regulatory powers might be able to be used to help protect these wild fish.

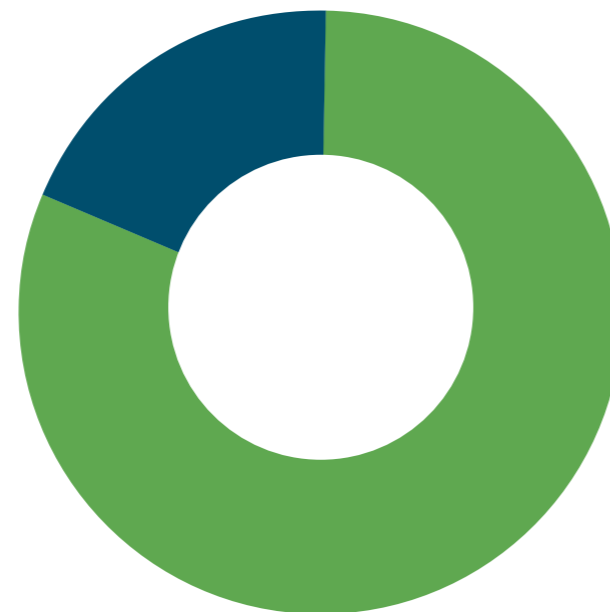
The work to develop and then consult on the framework will take several months and so will not be in place until later next year. In the meantime, we will be doing a number of things that should directly or indirectly help reduce the contribution of marine cage fish farms to sea lice numbers in coastal waters. These include:

- requiring fish farmers wishing to discharge sea lice medicine residues to demonstrate that they are taking steps to try to prevent sea lice infections and using best practice, non-chemical methods to help deal with infections that do arise;
- working with farms in the same sea areas to promote and encourage coordinated fallowing and, where possible, coordinated treatment of sea lice infestations: by reducing sea lice numbers this may also reduce overall medicine use; and
- working with farms to encourage consolidation of open-net cage production in dispersive environments away from river mouths.

Key issues contributing to non-compliance

- Seabed surveys failing licence conditions
- Medicine/Chemical treatment causing sediment samples to exceed environmental quality standards
- Discharge quality failures
- Other reasons for failure include: insufficient or poor data returns; cage configuration and location

Compliance (Figure 9)



Key

- 81% Compliance
- 19% Non-compliance

Marine cage fish farms (MCFF) – What is causing the non-compliance?

1. Failing seabed surveys

For 70% of the 47 MCFF that failed SEPA's compliance assessment scheme in 2017 a failing seabed survey was a contributing factor.

Formal action is taken where it is found that the seabed is impacted by the deposition of waste (faeces, food and medicine) to the extent that it fails to meet environmental standards.

Where we find failures of standards, we take appropriate action to secure the protection of the marine environment. This action may include reducing the number and density of fish (biomass) allowed at site or medicine usage, through the variation of licences.

The actions above are often successful on the first intervention but can require a number of corrections before the site operations are matched to the receiving environments capacity.

2. Late submission of monitoring and other reasons

17% of failures at MCFF are due to late submission of monitoring data to assess compliance. The remaining 13% are split between:

- quantities of medicines used exceeding that permitted;
- management and operational issues; and
- cages being sited in a different configuration or slightly different location than that permitted by licence.

Freshwater sites – What is causing the non-compliance?

1. Effluent failing to meet discharge quality standards

44% of freshwater sites that fail SEPA's compliance assessment scheme, do so because of failing effluent discharges. This has the potential to lead to pollution events and impacts on local amenity.

These failures are resolved through working with the operators to improve working practices, seeking further investment in treatment technologies and where necessary undertaking formal action.

33% of non-compliant sites are failing because of failure to provide data to assess compliance.

The remainder are non-compliant due to over abstraction of freshwater and inadequate infrastructure to treat discharges or monitor abstractions.

We believe that those societies and economies that are low resource use, specifically low energy use, low water use and low waste will be the most successful in the 21st century. Businesses that are the most innovative will best rise to the challenges of our time, such as over use of resources and climate change and create sustainable economic growth.

To do this, mere compliance and small scale incremental change will not be enough. At SEPA we want to help businesses and sectors to implement successful innovation and support them in their ambitions to do more than they are required to by regulation.

We call this “moving beyond compliance”: helping already high performing businesses to do more for

the environment because it makes sense for them to grow in a sustainable manner.

For the finfish aquaculture sector, going beyond compliance and improving environmental performance will help bring higher quality produce, better reputation and increased consumer confidence. This stands to benefit those businesses in the sector who pursue these opportunities. SEPA will support and encourage the following potential opportunities:

Water

- Increasing the use of recirculating aquaculture systems.
- Innovation in the methods of collection and neutralisation of medicine residues with a view to minimise discharges to the environment.
- Increasing the non-medicinal treatment of disease and parasites.

Energy

- Diversifying infrastructure to seize the opportunity of low carbon and renewable energy generation.
- Exploring the use of renewable and low carbon fuels for land and sea transportation.

Materials

- Pursuing sustainable protein sources for feed through creation of circular economy opportunities.
- Developing alternative sources of omega 3 oil for feed to reduce pressure on existing fish sources of the oil.
- Developing means of reducing low value, single use plastics, recovering litter and re-using valuable materials throughout the packaging processes.
- Making best use of faeces and waste food by capturing them and recovering energy and other resources from them.

Improving evidence through partnership working

With partner agencies, academic institutions and industry we will progress the following:

- Strengthening our understanding of impacts on the seabed, in particular the biodiversity of hard substrates including protected habitats.
- Improving diagnostic tools for enhancing the ability to detect and understand the toxicological effects of medicines and other chemical treatments on the environment.
- Better understanding how to manage the interactions between wild fish and finfish aquaculture.

What actions are we going to take?

The following actions will help deliver the set of compliance and beyond compliance aims specific to this sector.

We will undertake the following actions to fix compliance issues in the sector and help businesses to take opportunities to go beyond compliance.

We will help responsible compliant businesses to operate by making it significantly harder and more expensive for those who persistently fail to comply with environmental regulation to operate. We will achieve this by increasing scrutiny, prescription, fees and the use of enforcement and monetary penalties for those who fail to comply.

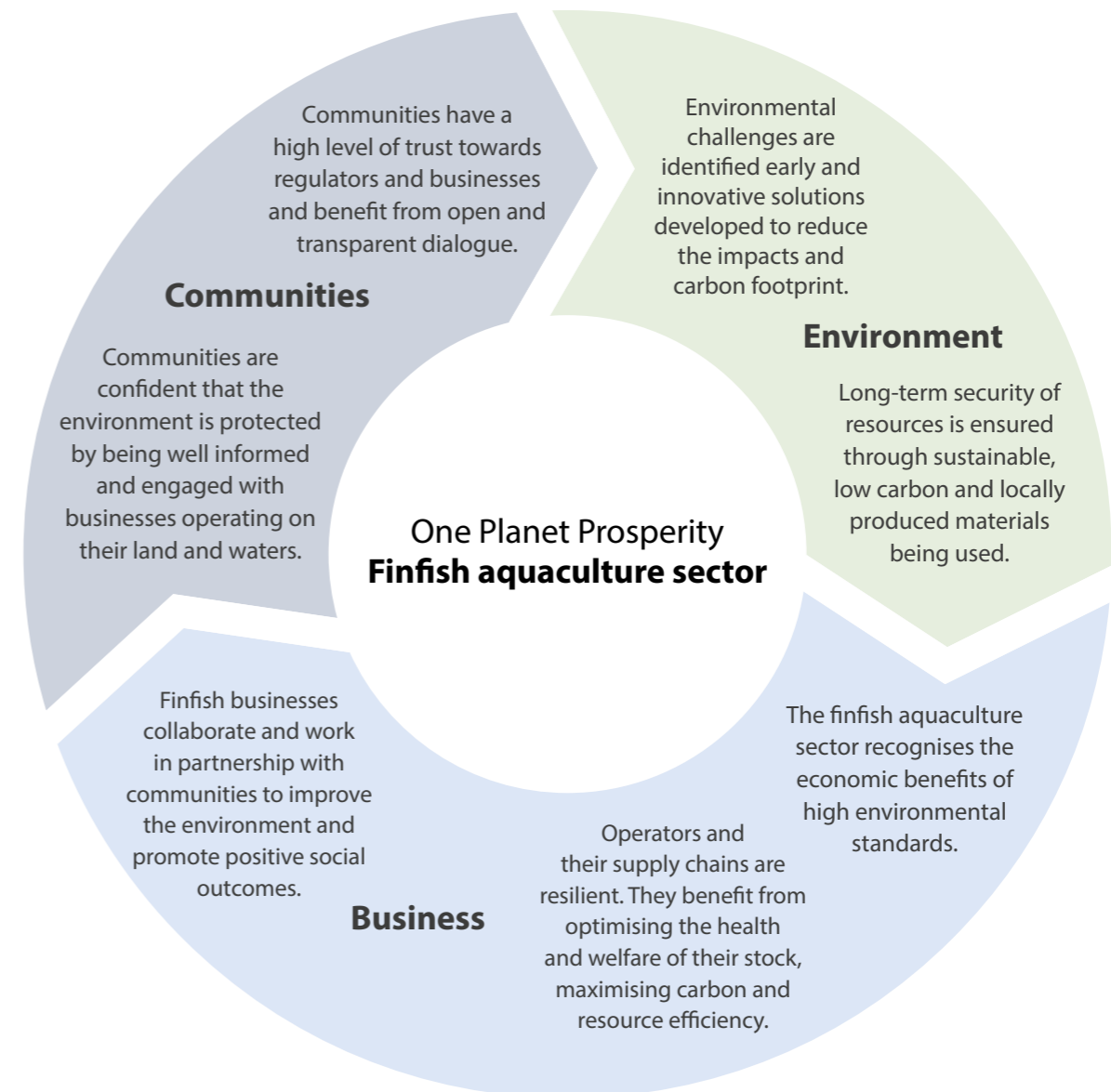
Delivering compliance and beyond (Figure 10)

Outcome sought	Action
<p>Enhancing the regulation of marine cage fish farms</p> <p>We will control the risk posed to the water environment and other users of the water environment from:</p> <ul style="list-style-type: none"> • discharges of organic matter; • discharges of medicines and other chemicals; and • discharges of nutrients. 	<p>We will implement a strengthened regulatory framework (see Annex 1) for protecting the marine environment from farm waste discharges. The framework will ensure that farm developments are matched to the capacity of the sea to disperse and assimilate their waste discharges.</p>
<p>Enhancing protection of wild fish</p>	<p>We will:</p> <ul style="list-style-type: none"> • work with Marine Scotland, as lead agency for wild fish, and other regulators to plan how we can best contribute to the protection of wild salmon and sea trout from any likelihood of significant risks posed by the effects of marine cage fish farms on sea lice abundance in coastal waters. • work with farms operating within connected sea areas to support and facilitate co-ordinated action (e.g. co-ordinated fallowing; sea lice treatment, etc.) to help reduce the prevalence of sea lice and hence reduce overall medicine usage.
<p>Achieving full compliance across the whole sector</p> <p>We will make clear to sector businesses that compliance with regulatory requirements is non-negotiable</p>	<p>We will:</p> <ul style="list-style-type: none"> • target our regulatory effort to bring non-compliant sector businesses, including feed producers, fish farmers and fish processors, up to full compliance as quickly as possible, including taking immediate regulatory action to address breaches of environmental standards. • for common breaches, work with sector businesses and trade organisations to develop guidance to help operators comply with the regulations. • progressively introduce simpler and outcome-focused licences for marine and freshwater fish farms to help sector businesses comply with their environmental management responsibilities and legal obligations. • provide simple and clear explanations of compliance results, which we will continue to make available to the public in a timely and easily accessible way.

Outcome sought	Action
<p>Supporting innovation</p> <p>We will bring potential innovation partners together and create opportunities for innovation through the way we regulate.</p>	<p>We will:</p> <ul style="list-style-type: none"> work with sector businesses, trade organisations, other regulators and international partners to encourage and support world-leading innovation in disease management, and in medicine design, capture and treatment, to help minimise discharges of medicines into the environment. bring sector businesses together with experts from other sectors to explore innovative opportunities to generate renewable energy; use low carbon transport; and maximise value from wastes. encourage and support investigative research into alternative, environmentally low-impact, sources of protein and omega 3 oils for fish feed. continue to invest in the development of environmental monitoring techniques that significantly increase the amount of environmental evidence that can be collected and significantly reduce the time needed to interpret that evidence and so inform regulatory responses. This will include the development and use of DNA-based environmental monitoring techniques; and exploration of remote-sensing techniques, such as the use of remotely operated submersible vehicles.
<p>Strengthening our evidence base</p> <p>We will continually work to build understanding of environmental risks and how they can be effectively mitigated.</p>	<p>We will work with other regulators, NGOs, research organisations, academia and sector businesses to:</p> <ul style="list-style-type: none"> improve understanding of where the effect of marine cage fish farms on sea lice abundance in coastal waters may be likely to be contributing significantly to impacts on wild salmon and sea trout populations and work with Marine Scotland, as lead agency on wild fish and others, to identify improved strategies for effectively mitigating any such impacts. strengthen understanding of the sensitivity of different seabed habitats to the impact of marine cage fish farms and other pressures. continue to build integrated models for all relevant marine areas of the cumulative effect over time of fish farm discharges and other pressures on the health of marine ecosystems, including the ability of those ecosystems to support protected species and habitats. We will work with partners to develop a risk assessment mapping tool to guide appropriate development. Update and improve Scotland's Aquaculture website to provide improved and comprehensive information about environmental performance of the sector. <p>We will:</p> <ul style="list-style-type: none"> extend our programme of investigative survey work to assess the individual and cumulative environmental performance of fish farms, coordinating with the sector and other regulators wherever possible.

6. Outcomes

If we achieve the vision we have set out in this plan, we anticipate that we will help to deliver the following positive outcomes that protect and improve the environment in ways that also protect communities and enable businesses to operate effectively and successfully in their markets.



7. Priority actions for 2019 - 2020

1. SEPA will deal with the ongoing non-compliance issues in the sector:

- SEPA will work with individual companies to require improvement at non-compliant sites and drive the sector towards full compliance.
- by working with partner agencies and regulators we will strengthen our regulatory approach through joint inspections and sharing of evidence where appropriate.
- implement the use of fixed monetary penalties in response to non-compliance in relation to data returns.

2. We will commence a programme of work to modernise the regulation of existing sites:

- we will implement a strengthened regulatory framework for marine cage fish farms (see Annex 1). This will include enhanced modelling and monitoring requirements.

3. Develop new licences with simple outcome focused conditions:

- new developments will have new licences and conditions. These will be phased in with marine developments, then freshwater developments and then other licences.

4. We will strengthen the environmental evidence available to support the industry's decisions where it is performing well and hold them to account where they fail to comply with regulation:

- we will design and target our environmental survey programmes to (a) check and assess the environmental performance of marine cage fish farms; and (b) continually check and improve the accuracy and reliability of marine modelling.
- we will develop and consult on a strengthened approach to assessing the cumulative effect of existing discharges from all sectors on status of marine ecosystems.
- by working in partnership we will improve the availability and access to information.

5. Through partnership working, we will undertake a programme of work focussing on assessing environmental outcomes of the use of medicines. In particular:

- explore new treatment technologies including treatment using wellboats or other solutions which offer treatment containment and environmental protection.

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ANNEX 1

PROTECTION OF THE MARINE ENVIRONMENT

DISCHARGES FROM MARINE CAGE FISH FARMS

A STRENGTHENED REGULATORY FRAMEWORK

1. Introduction

This document sets out our proposals for updating and strengthening the regulatory framework we use to protect the marine environment from discharges from marine cage fish farms.

To get to this point, we reviewed and developed the underpinning science; analysed the strengths and weaknesses of our existing framework; talked to people in the sector and beyond; and looked at approaches in other countries. We consulted on some initial ideas last year and gave careful consideration to the responses received. Finally, our thinking has benefited from the evidence provided to the inquiries into salmon farming conducted by the Scottish Parliament's Environment, Climate Change and Land Reform Committee and its Rural Economy and Connectivity Committee earlier this year.

Marine cage fish farming has grown and changed significantly since our existing regulatory framework was first introduced. The average size of farms has increased. There has also been a shift away from very sheltered, non-dispersive locations where farms were concentrated in the early stages of the sector's development. Our scientific understanding, including our ability to model the fate of discharges in the sea, has also substantially improved. The way we regulate needs to reflect and respond to these changes.

We believe we have now designed a new framework that will strengthen and future-proof our ability to deliver world-leading protection of the marine environment, whatever way the sector develops going forward. But it is very important for Scotland's environment and the sector and stakeholders that we have got it right. That is why we are asking you to give us your feedback as a final check before we start to use the framework.

2. Managing discharges into the sea

Marine cage fish farming across Scotland operates using open-net cages. Fish faeces; any uneaten food; used fish medicines and other chemical treatments escape from these cages into the marine environment. The heavier, organic particles (the fish faeces and uneaten food) together with any medicines sticking to them are deposited on the sea floor. Natural biological process then break down and assimilate the material over time. Dissolved chemicals released from the farm, including any medicine residues and other chemicals not bound to the heavier organic particles, remain dispersed in the water column until broken down and assimilated.

To protect the environment, the organic matter and chemicals escaping from the cages have to be sufficiently diluted as they disperse and mix in the sea to avoid them reaching levels that would harm sea life.

The two main factors that determine whether wastes from a fish farm are sufficiently diluted are:

- the quantity of the wastes being released; and
- the capacity of the sea to disperse the wastes.

The latter varies according to depth, strength of current and, to a lesser extent, winds. The quantity of organic wastes released into the sea from open-net cages depends on the amount of feed used and the biomass of fish. In other words, how big the farm is. The quantities of medicine released depend in part on farm size but also on a site's vulnerability to disease and infections; the use by the farm of non-chemical techniques to help manage disease and infection outbreaks; and the effectiveness of those techniques.

To protect the marine environment, waste releases, and hence farm sizes and medicine usages, have to be appropriately matched to the sea's capacity to disperse and assimilate wastes. As environmental regulator, it is our role to make sure this is the case.

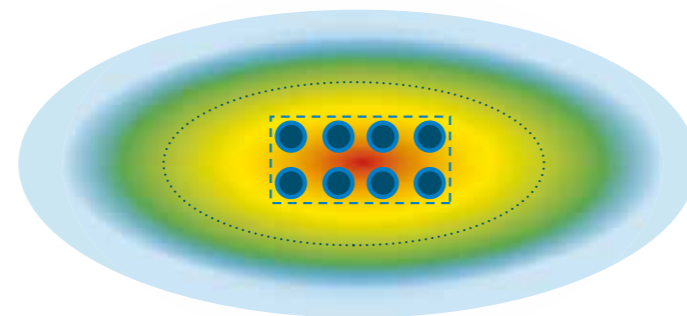
3. Basics of the proposed new framework

Mixing zones

Immediately around fish farm cages, there is a zone in which wastes are not fully mixed and dispersed in the surrounding sea. Under the new regulatory framework, we will limit the maximum scale of this mixing zone (Figure 1).

The limit will be equivalent to the 100 metre-based limit we apply to all other discharges to the marine environment, including industrial discharges and discharges of effluent via long-sea outfalls. Fish farm operators will have to manage their sites so that there is no significant adverse impact on the biodiversity of sea life beyond the edge of the mixing zone.

Spatial limit on mixing zones (Figure 1)



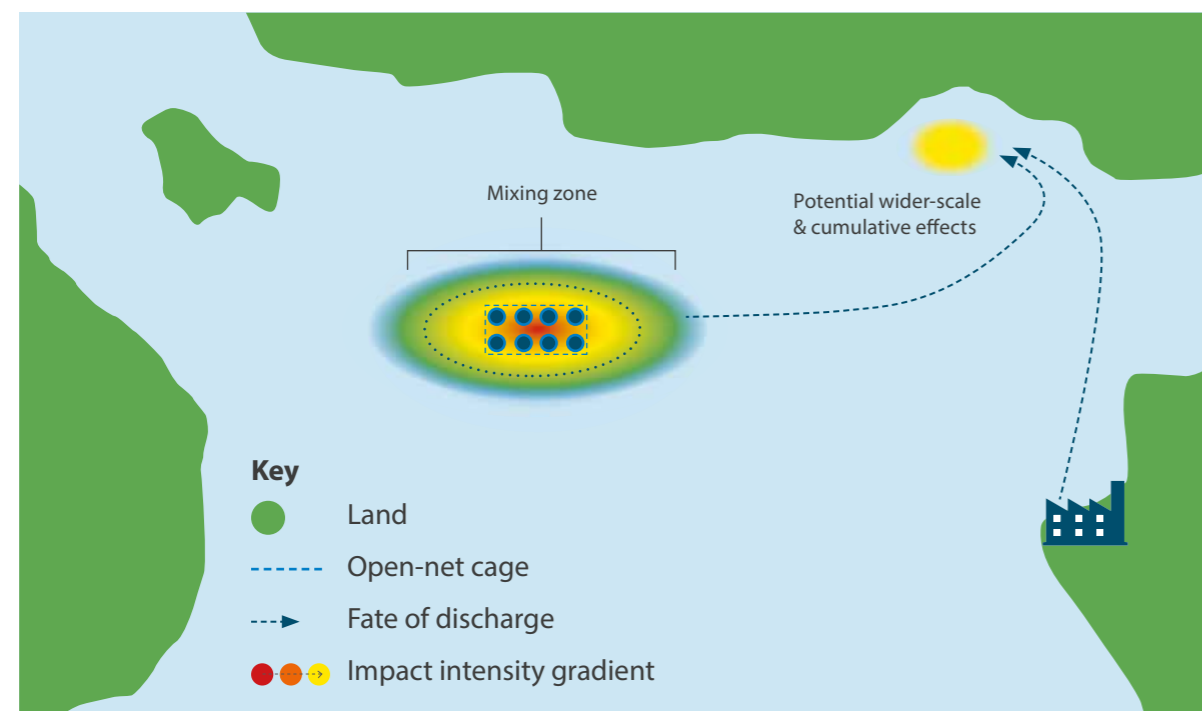
- Key**
- Fish cage
 - Good quality marine environment
 - Mixing zone limit
 - ● ● Impact intensity gradient

Wider marine environment

Wastes can be carried by currents over considerable distances from the mixing zone. Most of this waste remains so diluted that it has no effect on the health of the marine environment. However, in some circumstances, there is a potential for wastes to combine with other wastes and accumulate in parts of the sea to levels that could harm sea life (Figure 2).

Fish farm operators will have to manage their sites so that where waste accumulation does occur, the degree of that accumulation is sufficiently limited to prevent it having a significant adverse impact on the biodiversity of sea life.

Cumulative risks to the wider marine environment (Figure 2)



4. Application of new framework to organic wastes

Improved management of waste inputs

When we license farms, we will continue to set limits on the maximum biomasses of fish that can be held at the farms and on the quantities and compositions of feed that can be fed to the fish. These limits will control the quantity of organic wastes that can be discharged into the sea from the farms. They will be based on meeting the mixing zone requirements and preventing risks to the wider marine environment.

Previously we only set limits on fish biomass. However, estimating biomass with precision is challenging. Setting limits on feed rate will make it easier for farmers to be sure they are complying with environmental requirements and for us to check compliance.

The new regulatory framework will deliver tighter and more consistent control of the spatial extent of mixing zones for organic waste discharges (Figure 3). The new framework will:

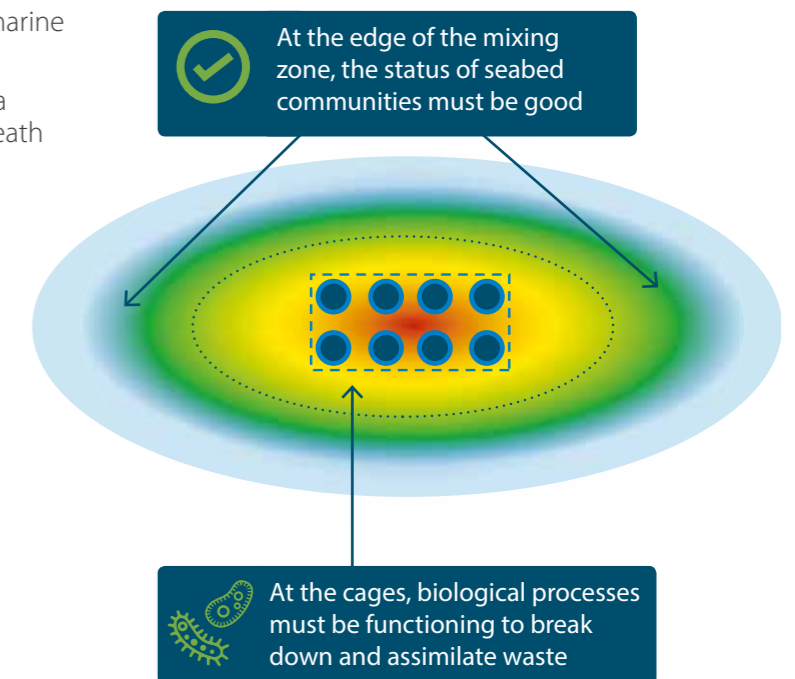
- continue to control the maximum intensity of impact permitted at cage edges;
- require that, by the edge of the mixing zone, deposition is sufficiently low for the status of sea life on the seabed to be good; and
- where there is any accumulation of organic waste outside of the mixing zone, the level of that accumulation remains low enough to avoid adverse impacts on the status of sea life on the part of the seabed where the accumulation occurs.

Environmental requirements

Under the existing regulatory framework, the primary ways we protect the marine environment from the impact of fish faeces and waste food on the marine environment are by:

- limiting the maximum severity of impact a farm can have on seabed life directly beneath the edges of the cages; and
- ensuring that, when a farm is operating, the spatial extent of its zone of impact on the seabed does not exceed the scale of impact modelled for the biomass of fish the farm is authorised to hold.

Mixing zone controls on discharges of organic waste (Figure 3)



- Key**
- Fish cage
 - Good quality marine environment
 - Mixing zone limit
 - ● ● Impact intensity gradient

¹ Where developments could affect a marine protected area or priority marine feature (e.g. because the area or feature would lie within, or very close to, the mixing zone), we carry out bespoke assessments to decide if there is a risk to the area or feature and, if so, what controls, including refusing authorisation, are needed to protect the area or feature.

The cage edge limit on the intensity of impact ensures that the wastes do not accumulate within the mixing zone to levels that would compromise the biological process needed to breakdown and assimilate them.

To assess whether the status of seabed biological communities at, and beyond, the boundary of the mixing zone is good, we will apply environmental standards² that have been developed on behalf of the UK's government administrations by the UK Technical Advisory Group³ (UKTAG). These standards are aligned to a definition of good status agreed⁴ across Europe and have also been checked for comparability⁵ with equivalent standards used by other European countries.

Environmental standards have not yet been developed for all seabed habitats. For such habitats, which include rocky seabed, we will use the best available science to assess whether or not the condition of the seabed's biological communities meets the agreed definition of good status. As more scientific data are collected on these habitats, we expect UKTAG to be able to progressively develop appropriate biological standards.

Timing

Once the consultation has concluded, we will aim to finalise the framework as soon as possible and then apply it immediately to discharges of organic wastes from proposed new farms and those from farms that are proposing to expand.

Most existing farms are likely to be able to comply with the new regulatory framework's requirements for organic waste without having to make any substantial changes to the way they operate currently. However, some may have to reduce biomass; move to more dispersive locations; or install systems to capture a proportion of the wastes they currently discharge.

² These standards are set out in directions to us issued by Scottish Ministers.

³ A partnership of the UK environment and conservation agencies.

⁴ The definition is set out in the Water Framework Directive.

⁵ As part of an intercalibration exercise coordinated by the European Commission.

We are proposing to phase existing sites into the new regulatory framework as outlined below. We would welcome your views on this proposal, including any modifications you would suggest and the reasons for them.

During 2019 the new regulatory framework's enhanced environmental monitoring requirements would be applied to all existing, active farms. A fish growth cycle typically lasts between 18 and 24 months therefore the majority of active farms will have submitted monitoring in accordance with the new framework by the end of 2021. There is a fallow period before fish are re-stocked after the end of each cycle. The minimum fallow period is six weeks but some farms will fallow for six months or more. Environmental monitoring is undertaken towards the end of each growth cycle.

We would use results of the enhanced monitoring alongside improved modelling to compare farm environmental performance against the new framework's mixing zone standards and criteria. We would then be able to identify which farms need to reduce their discharges in order to meet those standards and criteria and which are already meeting them. At the same time, we would utilise the additional monitoring information to strengthen our assessments of compliance with the existing regulatory frameworks' environmental requirements.

From the end of 2021, all farms that we have assessed as meeting the new mixing zone standards and criteria would be regulated fully under the new regulatory framework.

By the start of any fish growth cycle that would continue beyond the end of 2024 or, otherwise, by the end of 2024, all existing farms that need to reduce discharges to meet the new mixing zone standards and criteria should be being regulated under the new framework.

We would consider allowing some flexibility over these timescales where a farm operator is:

- in the process of putting in place innovative solutions to improve environmental performance, such as new infrastructure for capturing waste faeces and uneaten food; and
- has engaged early with us about the need for a limited extension whilst that process is completed

Implications

The new framework will deliver consistent and stronger protection of the marine environment as the sector evolves. It will ensure that the quantities of waste discharged are matched to the capacity of the seas around the farms to assimilate the waste.

In sheltered waters with weak currents, the regulatory framework's cage edge requirements will remain the dominant factor controlling the quantities of organic waste that can be discharged and, hence, the sizes of farms that can operate with open-net cages. At locations that are moderately dispersive, larger farms can be supported and the mixing zone size limit will start to be the dominant control on farm scale. At the most dispersive sites, little waste is deposited for long in mixing zones and avoiding any cumulative risks to the wider marine environment will become the primary factor governing the farm sizes that can be accommodated.

Large farms using open-net cages will need to operate in locations with sufficiently strong currents to disperse the organic wastes they produce. In more sheltered locations, small size farms would be accommodated but the development of large farms would require the capture and removal/treatment of a substantial proportion of the organic wastes that are produced.

5. Application of new framework to medicine discharges

Improved management of medicine input

Medicines and other chemical treatments for farmed fish can be extremely toxic to sea life at very low concentrations.

Under the new regulatory framework, we will expect farm operators to make every effort to minimise the need to discharge chemicals into the environment by reducing the need to treat fish using medicines.

Farmers applying for new or increased discharges of medicines will have to develop and implement a plan aimed at minimising their need to use medicine. We will expect such plans to include:

- implementing all practicable, preventative steps to reduce the risks of infections, disease and parasites;
- utilising a range of available non-chemical treatments to help control disease and parasite outbreaks; and
- regular updates that incorporate developments in new, more effective preventative techniques or non-chemical treatments.

Putting the plans into practice will help lower risks to the environment by reducing the quantity of medicines discharged and conserve the sea's capacity to accommodate discharges of medicines when their use is necessary.

Environmental requirements

There are two main ways in which medicines, in particular sea lice medicines, are used to treat farmed fish. Some medicines are applied by immersing the fish in a solution of the medicine. This may be done in a bath at the cages or the fish may be taken into a tank containing the medicine solution on a boat, called a well-boat.

Other medicines are incorporated into fish food ("in-feed"). This medicated food is then fed to the fish over a number of days. During and following treatment, residues of the medicines are excreted by the treated fish. The residues typically stick to particles of organic matter in the fish faeces, which are then deposited on the seabed.

Existing framework

The existing regulatory framework differs for in-feed medicines and for those administered in a solution in a bath or well-boat:

- For in-feed medicines, our current regulatory framework already uses the equivalent of a 100 metre-based mixing zone.
- For discharges of treatment solutions from baths on farms, there is currently no direct equivalent to a spatial limit on mixing. Instead, farmers have to ensure that within specified periods of time after a medicine's discharge into the sea (3 or 6 hours; and 72 hours), it has been sufficiently diluted to achieve the environmental standards defined for each of those periods of exposure to the medicine.
- Discharges of treatment solutions from well-boats are currently regulated separately by Marine Scotland.

In-feed medicines

For in-feed medicines, we will apply the same 100 metre-based mixing zone limit that we will use for organic waste discharges. We will require that, by the edge of the mixing zone and in any accumulations of wastes deposits beyond it:

- the concentrations of the medicines in the seabed do not rise above levels that have been determined⁶ to have no adverse effects on sea life; and
- the status of seabed communities does not drop below good status as a result of in-feed medicine usage. This assessment will be based on the same biological standards and criteria that we will use when assessing organic waste deposition.

Emamectin benzoate

Since October 2017, we have been regulating the use of the in-feed sea lice medicine, emamectin benzoate, according to an interim position, pending establishment of new environmental standards.

Under that position, we used interim environmental standards to assess and control risks posed by any proposed new or increased discharges of the medicine to marine protected areas and priority marine features. The interim environmental standards are significantly tighter than the existing standards.

We have now revised our interim position. The new interim position extends the use of the interim environmental standards to assessing and controlling risks posed to any areas of coastal water by proposed new or increased discharges of the medicine.

We have made this change to our interim position in the light of the increased and now substantial weight of evidence that the existing standards do not adequately protect marine life.

We have asked the UK Technical Advisory Group (UKTAG) to make recommendations on new environmental standards for emamectin benzoate to the Scottish Government. UKTAG is a partnership of the UK environment and conservation agencies. It was established by the governments of the different parts of the UK to oversee the scientific process of developing the environmental standards used across the UK for protecting the water environment.

UKTAG is in the process of developing its recommendations. This includes obtaining and considering independent scientific peer reviews of the evidence. After UKTAG makes its recommendations to the Scottish Government, Scottish Government will consult on draft directions on the establishment of new environmental standards.

Bath medicines

For medicine residues discharged from bath treatments on farms, we are planning to apply the same mixing zone limit that will apply under the new framework to organic wastes and in-feed medicines.

This will increase our ability to ensure that the environment beyond the mixing zone is protected. It will also mean a consistent approach to control across all discharges from farms.

We plan to apply the mixing zone limit to proposed new bath treatment discharges, and to proposed increases to existing discharges, from the end of 2021. This timescale will allow us to complete the testing of computer models for assessing applications; and finalise the development of the analytical methods that will be needed to accurately measure whether the concentrations of the medicines prior to discharge are sufficiently low to meet the mixing zone standards. It will also allow time for us to work with Scottish Government to help ensure consistency in the way proposals for medicine discharges from well-boats are controlled.

We are proposing to phase existing bath medicine discharges into the new regulatory framework as follows:

- We would aim to identify those existing farms that are already complying with the new framework's mixing zone requirements and those that are not by the end of 2021; and
- require those farms that need to make changes to comply with the new mixing requirements to do so by the start of any fish growth cycle planned to continue beyond the end of 2024 or, otherwise, by the end of 2024.

We would consider allowing some flexibility over these timescales where a farm operator is:

- in the process of developing innovative solutions or otherwise making significant improvements in farm environmental performance; and
- has engaged with us early about the need for a limited extension whilst that process is completed.

We would welcome your views on this proposal, including any modifications you would suggest and the reasons for them.

⁶ Standards are derived using a scientifically rigorous process that takes account of the available scientific evidence on the likely toxicity of the medicine to sea life. Standards are reviewed when the scientific evidence changes.

6. Managing applications

Next generation medicines

Next generation medicines and other chemicals include bespoke, newly developed medicines; medicines already in use in other sectors, such as agriculture; and medicines that stopped being used in marine cage fish farming some time ago but may be used again.

To protect the marine environment from the risks posed by any proposed discharges of a new medicine or other chemical, there will need to be sufficient data in advance, to derive an appropriate environmental standard for that medicine or other chemical.

We are only likely to consider authorising discharges of new medicines and other chemicals if sufficient data on likely harmful concentrations for sea life have enabled the establishment of a scientifically robust environmental standard.

The regulatory framework we are proposing for the current generation of medicine discharges is based on using the sea's capacity to disperse and slowly breakdown and assimilate the residues. This approach is not suitable for any next generation medicine that is more persistent in the environment and has more potential to bio-accumulate than the current suite of medicines. For medicines with such properties, we will expect farms to capture and de-nature the medicine before any residues are discharged.

Implications

We anticipate that the practical outcome of the revised interim regulatory position on emamectin benzoate is likely to be that very few farms wishing to use the medicine for the first time, or to increase their existing use of it, will be able to do so. In most cases, discharges of the quantities needed for effective treatment of fish will not be able to comply with the interim environmental standard. The most likely discharges that might be able to comply are those from treatments of small biomasses of fish.

There are no immediate implications of the updated regulatory position on emamectin benzoate for existing farms. However, we are advising operators to plan for the strong likelihood that they will need to significantly reduce or cease discharges within a reasonable period of time following finalisation of a new environmental standard set by the Scottish Government.

The application of the mixing zone requirements to discharges of medicine residues from bath treatments will mean that the permitted maximum discharge quantities will be greatest in the more dispersive farm locations and least in sheltered, non-dispersive locations.

We do not have sufficient information yet to assess the implications of the mixing zone standards for the biomasses of fish that can be effectively treated with medicines administered using baths. We will work with the sector to improve understanding of this in advance of the planned 2021 timetable for starting to apply the new framework to these medicines. This understanding will enable those wishing to make bath treatment discharges to identify whether the discharges would be too large for the sea around the farm to accommodate. In such cases, the farm may need to install systems to reduce the concentration of the medicine residues prior to making the discharge.

All new fish farms; increases in the size of existing farms; and new or increased discharges of medicines require prior-authorisation from us.

The requirement for prior-authorisation allows us to make sure that the scales of the discharges from a proposed farm development are properly matched to the capacity of the surrounding sea to disperse and assimilate them. Under the new framework, we will check proposals match this capacity by assessing whether they would satisfy the mixing zone requirements and not contribute to cumulative impacts on the wider marine environment.

We need good, scientifically-sound information to make these assessments. Applicants will normally need to provide us with:

- baseline monitoring of the condition of the sea bed;
- modelling of the expected dispersion of wastes around the site; and
- hydrodynamic modelling of the wider-scale dispersion of waste from the site.

Under the new framework, as well as enhanced baseline survey information, applicants will need to use the latest scientific computer model⁷, or agreed equivalent, to provide us with simulations of organic waste and medicine deposition on the seabed around proposed farm developments.

Hydrodynamic modelling will be required where risks to the wider marine environment, including to marine protected areas, cannot be ruled out without it. Impacts on the wider environment are unlikely and can usually be ruled out in cases where:

- proposed farms are small;
- only small quantities of waste are expected to be carried by currents beyond the sea around the development; or
- the development would sit within a large expanse of open sea that receives few, or no, other discharges.

⁷ The model is called "NewDepomod". Its development was led by Marine Scotland and undertaken by the Scottish Association of Marine Science.

7. Ensuring compliance

Where we have authorised a marine cage fish farm, the operator has a duty to comply with the conditions of the authorisation and ensure the marine environment is not damaged. We believe it is important that operators know and understand environmental risks so that they can manage them accordingly.

Monitoring the operation of a farm

To manage environmental risks, operators need to have tight control of activities on the farm that govern the quantities of wastes released into the sea. These include the biomasses of fish held at any one time; the amount of feed given to the fish; and the quantities of medicines and other chemicals used.

Now, we will require operators to maintain records of the details of each of these activities and submit reports to us on a regular basis, normally quarterly. In due course, we will expect farms to monitor one of the key activities, the adding of feed to the cages, using automatic logging systems capable of sending us information about feed rates, electronically in real-time.

Monitoring environmental performance

We require operators to monitor the environment to check the environmental performance of their farms. Under the current framework, operators are typically required to monitor seabed biological communities and medicine residues at one cage edge location and in one small area at the boundary of the modelled zone of impact.

Under the new framework, operators will be required to undertake the monitoring needed to assess each farm's environmental performance in relation to mixing zone limits and the avoidance of impacts on the wider marine environment. This will require much more and better monitoring than under the current regulatory framework.

More operator monitoring information should also increase certainty about whether or not sites are complying with environmental requirements. For it to do this, we need to know that environmental samples were collected and analysed; and the results managed and reported, in accordance with methods and standards specified by us.

Under the new framework, we will require operator monitoring to conform to a quality assurance scheme⁸ that is independently accredited by a suitably qualified external assurance scheme. This will give us confidence that operators and their sub-contractors are following the rules. We have a lot of work to do to develop such a scheme. We will work with the sector, accreditation authorities and stakeholders to progressively develop the scheme.

A greater number of environmental samples will typically have to be collected and analysed than under the existing regulatory framework. However, as now, sampling required by authorisation conditions will be concentrated in one short period in each fish growth cycle. The intensity of monitoring needed in that period will also vary. A farm operating close to the maximum capacity of the sea to accommodate its wastes will be expected to carry out more monitoring to understand and ensure its environmental performance than a farm operating comfortably within the sea's capacity limits. Some farm operators have already run trials of enhanced monitoring on a voluntary basis at a small number of sites. These have provided valuable information for the operators and us. Such voluntary additional monitoring may well be of value to farmers in the future to enable adaptive management of their farms impact on the environment.

We will not be dependent purely on operator information. We will increase our own monitoring programme in order to assess the new framework. We will:

- carry out audits, including, for example, visiting farms to check that environmental samples are being taken from the correct locations; and to check records of farm activities;
- undertake our own surveys of fish farms and of possible cumulative effects on the wider marine environment.

We will continue to make all the appropriate and relevant information we hold about individual farms available. We will also work to make sure that information on the environmental performance and compliance of individual farms and the sector as a whole is presented in a way that can be easily understood. This will include working with other fish farm regulators to progressively improve Scotland's aquaculture website⁹.

Farms that operate well will get public recognition for doing so. Failures to protect the environment and comply with the authorisation conditions will not be tolerated. We will deal robustly with non-compliances using our expanded suite of enforcement options and in accordance with our Enforcement Policy.

⁸ Measurement Assurance and Certification Scotland, which is founded on ISO 17025.

⁹ <http://aquaculture.scotland.gov.uk/>

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