PART 1

STRATEGIC ENVIRONMENTAL ASSESSMENT

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PART 1. STRATEGIC ENVIRONMENTAL ASSESSMENT

Section 1.1 Aquaculture in South Africa

Aquaculture[1] means the farming of aquatic organisms in controlled or selected aquatic environments, which includes marine, brackish and freshwater, and involves a degree of human intervention in the rearing process to enhance production which may include propagation, breeding, regular stocking, feeding or protection from predators. Aquaculture also entail individual or corporate ownership of the stock being farmed, and could include ranching.

In South Africa, the aquaculture sector is a fast, developing industry that has the potential to grow and significantly contribute towards food security, nutrition, economic activity, poverty alleviation and improving the inclusivity of the sector. Sustainable development of aquaculture has the potential to create skills-based employment opportunities and promote sales of products on local and foreign markets, in addition to reducing the fishing pressure on South Africa's wild fisheries stocks.

In 2014, the South African National Government has launched Operation Phakisa with the sole aim of implementing priority economic and social programmes and projects better, faster and more effectively. One of the key sectors within Operation Phakisa is the promotion of Oceans Economy. Aquaculture, in addition to Oil and Gas, Marine Manufacturing and Transport, and Marine Protection and Governance, were selected as initial focal areas for enhancing the Oceans Economy.

The Aquaculture work stream under Operation Phakisa has highlighted the exceptional growth potential of the South African aquaculture sector due to an increasing demand for fish and fish-based products, especially since aquaculture currently contributes less than 1% to total fish supply in South Africa.

South Africa's aquaculture sector, comprising a recorded 216 marine and freshwater operational farms, is characteristic of a limited range of aquatic plant and animal species that has experienced a rapid increase in total production in recent years, from about 3 937 tonnes in 2012 to approximately 6 013 tonnes in 2016 (DAFF, unpublished[2]). These figures exclude seaweed, carp, ornamentals and koi carp production.

South Africa has seen a significant growth of investment in its aquaculture sector with contributions from government and the private sector. During 2015, a total additional investment of approximately R 264 million was achieved from both the marine and freshwater aquaculture sectors, which represents an increase of 35% from the R 162 million invested in 2014 (DAFF, 2016[3]).

The aquaculture sector contributes to economic growth and improving livelihoods by creating job opportunities as a food supplier and income generator. The increase in employment experienced in the sector over the past decade can be attributed to an increase in aquaculture production, investments and increased support from the government. Government support programmes such as Operation Phakisa and the Aquaculture Development and Enhancement Programme (ADEP) are aimed to stimulate further investments, increased production and job creation in the sector. In 2015, a total of 282 additional jobs were created by the sector through ADEP projects, with an additional 261 jobs through Operation Phakisa Aquaculture priority projects (DAFF, 2016). It is estimated that the marine and freshwater aquaculture sector in South Africa now employs around 15 000 people in direct and full time positions.

South Africa's local aquaculture market movement is mostly influenced by market price, consumer awareness, ease of accessibility and species availability. The increasing awareness of environmental sustainability and the increasing health concerns of consumers have resulted in increased demand for aquaculture products. Therefore, South Africa continues to import low value species at cheaper tariffs to satisfy the local market. However, high value species which include abalone are exported due to higher returns from the international market (DAFF, 2016).

During 2015, South Africa exported approximately 1 399 tonnes of aquaculture products with an estimated value of about R 488 million, with Hong Kong being the leading importer of aquaculture products, followed by Botswana and Taiwan. In the same year, South Africa has imported a total of 6 968 tonnes of aquaculture products with an estimated value of R 268 million, with Norway being the leading supplier accounting for imports worth R 205 million. China was the second leading supplier (DAFF, 2016).

Aquaculture products destined for human consumption is subject to rigorous food safety regulations and requires implementation of regular monitoring and control measures to ensure compliance. South African aquaculture farms, in particular those cultivating molluscan shellfish species, are inspected and monitored for hazardous substances and harmful micro-organisms such as *Escherichia coli*, *Salmonella* species and *Vibrio* species. Bio-toxins that are monitored includes Paralytic Shellfish Poisoning (PSP) toxins, Diarrhetic Shellfish Poisoning (DSP) toxins and Amnesic Shellfish Poisoning (ASP) toxins. Other hazardous substances which are monitored includes heavy metals (lead, mercury, inorganic arsenic and cadmium), pesticides, drug residues, dioxins, PAH, dyes and PCBs (DAFF, 2016).

South African aquaculture faces several challenges, one of which is predominantly the apparent over-regulation of the sector. Each new development requires numerous approvals from a number of different governing authorities which are currently issued in a cascading manner due to various regulatory timeframes. Other challenges include that production is focused on a few high-value species, scarcity of good quality freshwater and a harsh marine environment, difficulty in accessing project funding, limited pool of skills and support services, unpredictability associated with climate change, vast difference between winter and summer temperatures, challenges with access to land and sea space, and perceived competition with the tourism and conservation sectors.

1.1.1 Marine

In 2019, a total of 146 existing and newly proposed marine aquaculture farms are recorded in the four coastal provinces of South Africa of which only 60 farms are currently operational. The Western Cape recorded the highest number of farms with a total of 85, followed by the Eastern Cape with 39 farms, Kwa-Zulu Natal with 12 farms and the Northern Cape with nine farms. Several marine aquaculture farms produce two or more marine species. Of these 60 farms, 30 are currently engaged in abalone farming – some of which also produces

[1] Department of Agriculture, Forestry and Fisheries (2018). Aquaculture Development Bill published in Government Gazette No. 41632 of 18 May 2018. ISBN 978-1-4850-0490-5. Cape Town.

[2] Department of Agriculture, Forestry and Fisheries (Unpublished). South Africa's Aquaculture Yearbook 2017. ISBN: XXX. Cape Town.

[3] Department of Agriculture, Forestry and Fisheries (2016). South Africa's Aquaculture Yearbook 2016. ISBN: 978-0-621-46172-5. Cape Town.

seaweed – followed by 16 in mussel farming, 16 in oyster farming and 15 finfish farms (DAFF, 2019[4]).

The South African marine aquaculture sector comprises mainly finfish, shellfish and seaweed culture. Finfish species that are typically cultivated include the indigenous dusky kob (*Argyrosomus japonicus*) and yellowtail (*Seriola lalandii*), as well as the alien Atlantic salmon (*Salmo salar*), Coho salmon (*Oncorhynchus kisutch*) and King salmon (*Oncorhynchus tshawatscha)*.

The main shellfish species being cultured include the indigenous abalone (*Haliotis midae*), black mussel (*Choromytilus meridionalis*) and oysters such as *Ostrea atherstonia, Striostrea margaritacea* and *Pinctada capensis*. Alien shellfish species in production include the Brown mussel (*Perna perna*), Mediterranean mussel (*Mytilus galloprovincialis*) and Pacific oyster (*Crassostrea gigas*), as well as the clams (*Mactra glabrata* and *Venerupis corrugatus*) and scallops (*Argopecten purpuratus* and *Pecten sulcicostatus)*.

These marine species are all being cultured on commercial, pilot or research scales, with bivalves mainly farmed on rafts or long-lines and abalone in land-based tanks with pump ashore technology. Finfish is typically farmed in sea-based cages or land-based re-circulating systems (RAS) (DAFF, 2016).

Aquaculture production is defined as the quantity of organisms produced from a farm specifically for human consumption and is expressed in tonnage. This definition applies to both marine and freshwater aquaculture activities; however, it excludes seaweed production which in South Africa is used as feed for abalone. Seaweed species including *Gracilaria verricosa*, *Porphyra capensis* and *Ulva lactuca* are often cultivated in combination with abalone farming.

South Africa's total marine aquaculture production in 2016 was 4 140.18 tonnes with the Western Cape Province having recorded a production of 3 784.35 tonnes and was the main contributor to South Africa's total marine aquaculture production. Following the Western Cape is the Eastern Cape and Kwa-Zulu Natal provinces with a production of 351.90 tonnes and 2.10 tonnes, respectively. The Northern Cape Province was the smallest contributor, recording an annual production of only 1.83 tonnes (DAFF, unpublished).

Total marine aquaculture production in South Africa has increased by about 2 536 tonnes (~240%) from 2000 to 2015 (Figure 1-1). The total marine aquaculture production has increased by 174.27 tonnes recorded in 2014 to 3 591.86 tonnes in 2015. From the total production the mussels sub-sector has contributed 49%, followed by the abalone sub-sector with 41%, and the oysters and finfish sub-sectors having contributed 8% and 2%, respectively. The total marine aquaculture contribution to the overall South African aquaculture production of 5 418 tonnes is 66% (DAFF, 2016).

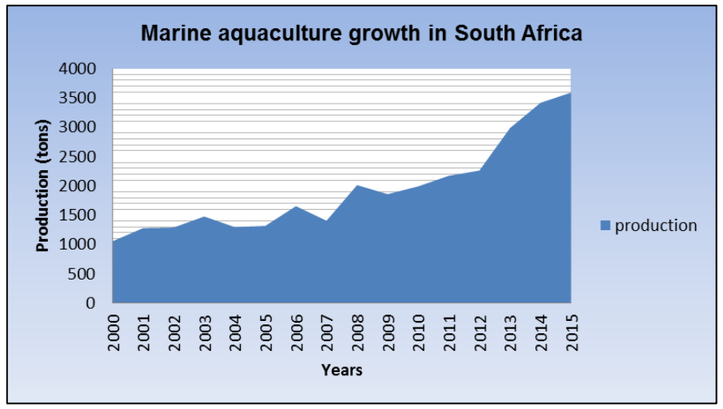


Figure 1-1: Marine aquaculture production from 2000 to 2015 (Source: DAFF, 2016).

1.1.2 Freshwater

In 2019, a total of 210 freshwater aquaculture farms were recorded from all nine provinces of South Africa. Based on known available information only 72 of these farms were operational at the time. The Western Cape recorded the highest number of farms with a total of 68, followed by Mpumalanga with 39 farms, Gauteng with 26 farms, Limpopo with 25 farms, Kwa-Zulu Natal with 20 farms, the Eastern Cape with 18 farms, North West with six farms, the Free State with five farms and the Northern Cape with three farms (DAFF, 2019[5]).

The freshwater finfish species that are predominantly being cultivated include African sharptooth catfish (*Clarias gariepinus)*, Brown trout (*Salmo trutta*), Rainbow trout (*Oncorhynchus mykiss*), Mozambique tilapia (*Oreochromis mossambicus*) and Nile tilapia (*Oreochromis niloticus*), as well as the freshwater crayfish, Marron (*Cherax tenuimanus)*. Other freshwater species in cultivation include crocodiles, goldfish, carp, grass carp, koi carp, eels, prawns and various tropical ornamentals. These species are primarily cultured on commercial scale, with only one on pilot scale in 2015 (DAFF, 2016).

Most South African freshwater aquaculture farms employ re-circulating systems (RAS), earth ponds or raceways for species cultivation (DAFF, 2016). Recently, also cage culture of mainly finfish species on large dams such as the Albasini and Vanderkloof dams is increasingly being developed.

South Africa's total freshwater aquaculture production in 2015 was logged at nearly 1 827 tonnes. The trout sub-sector was the highest contributor with 1 497 tonnes (~82%), followed by tilapia with about 325 tonnes (~18%) and marron crayfish with four tonnes (0.22%).

From 2006 to 2015, South Africa's total freshwater aquaculture production has been recorded as 13 764.60 tonnes, demonstrating and increase of 85% (Figure 1-2). In 2015, the total freshwater aquaculture contribution to the overall South African aquaculture production of 5 418 tonnes is 34% (DAFF, 2016).

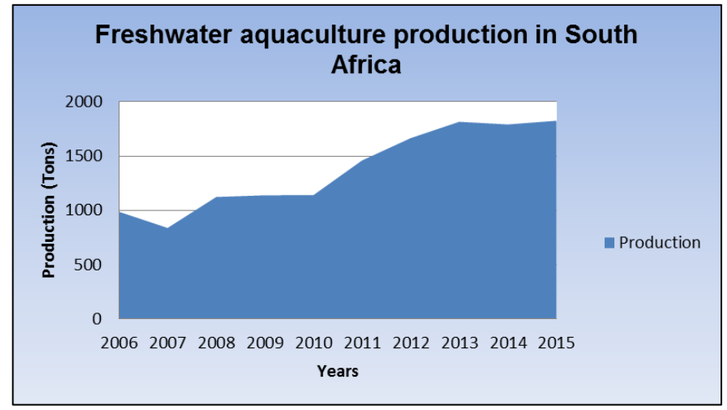


Figure 1-2: Freshwater aquaculture production from 2006 to 2015 (Source: DAFF, 2016).

[4] Department of Agriculture, Forestry and Fisheries (2019). Marine Aquaculture Rights Register, February 2019. Cape Town.

[5] Department of Agriculture, Forestry and Fisheries (2019). Freshwater Aquaculture Farms Database, September 2019. Pretoria.

Section 1.2 Study Objectives

1.2.1 Need for the SEA

In 2012, Cabinet has adopted the National Development Plan (NDP), which provided South Africa's plan to accelerate infrastructure development in order to address service delivery backlogs and facilitate economic growth and job creation. The NDP would be achieved through the implementation of Strategic Integrated Projects (SIPs), of which an initial 18 were identified.

It is the vision of the South African government to promote and grow the domestic aquaculture sector in a manner that contributes to food and nutritional security, creates sustainable jobs, fosters economic development, stimulates rural development and supports livelihoods, attracts investment, safeguards the environment and creates opportunities for SMMEs and wealth-generation.

To ensure that when required, environmental authorisations are not a cause for delay, the then Department of Environmental Affairs (DEA) has embarked on a program of Strategic Environmental Assessments (SEAs) for large scale developments to support the SIPs. The intention of undertaking SEAs is to pre-assess environmental sensitivities within the proposed development areas at a strategic scale to simplify the site specific environmental impact assessments (BA/EIA) when these are undertaken, and to focus the assessment requirements on the sensitivity of the specific site.

Aquaculture in South Africa is still in the developmental stage and therefore has the potential to grow and to contribute towards job creation, food security and improving the inclusivity of the sector. Aquaculture also has the potential to reduce the reliance on wild fisheries thereby promoting sustainable fishing.

One of the major challenges impacting negatively on the economic growth of the aquaculture sector is the lack of an integrated enabling legislative environment. For this reason, the then Department of Agriculture, Forestry and Fisheries (DAFF) has embarked on a process of undertaking EIAs for several aquaculture development zones (ADZs) around the country to create an enabling environment for the development of new facilities. However, there are numerous challenges associated with this process which include the high cost of conducting EIAs for individual ADZs, the expiry of environmental authorisations after a specified period, the need to assess alternative locations within an EIA and the fact that most investors show serious interest to invest only once the authorisation is granted.

The DEA and the DAFF, now the Department of Environment, Forestry and Fisheries (DEFF) have decided to address the concerns of the aquaculture industry by commencing with a national scale strategic environmental assessment (SEA) with the aim of streamlining, fast tracking and, possibly reducing the number of environmental approvals and permits that are required for these projects within the areas that are identified.

The Council for Science and Industrial Research (CSIR) was appointed in 2016 to undertake this SEA process with the main objective to identify strategic focus areas for marine offshore, nearshore and land-based, and freshwater instream aquaculture within the country for the prioritising and incentivising of aquaculture. The SEA further aims to be developed through the extensive use of spatial tools, positive and negative mapping of environmental attributes, sensitivity mapping and assessment of potential impacts including cumulative impacts and risk assessments. It is intended that through a high level pre-assessment of the environmental sensitivities within these strategic focus areas, application for environmental approvals and permits required for listed aquaculture development activities could potentially be fast-tracked, especially should these proposed projects be located in areas of confirmed low and medium sensitivity.

1.2.2 Identification of Aquaculture Development Zones

The main purpose of the SEA is to promote and support the continues growth of the aquaculture sector in South Africa through the identification of strategic focus areas where environmentally sustainable aquaculture development is technically suitable and can be prioritised. The intention is to gazette these strategic focus areas as aquaculture development zones (ADZs). A further incentive is to recommend options for potential integration and streamlining of existing environmental approvals and permits that are required to engage in aquaculture, across different mandating authorities to reduce regulatory complexities and support expedited decision-making.

Integration has been achieved through utilising the best available spatial data to identify optimal or suitable areas across the country with the highest commercial potential for aquaculture (i.e. in terms of technical and operational requirements), highest social need (i.e. need for development and job creation), and where possible, lowest environmental sensitivity (i.e. fewest environmental risks or constraints). These identified strategic focus areas are to be prioritised as aquaculture development zones for both marine and freshwater aquaculture development.

1.2.3 Integrate and Streamline Decision-Making

The South African aquaculture sector faces many challenges which include among others, the economic crises, climate change, limited freshwater resources, high energy coastline, user conflict, and sufficient access to available land and sea space, as well as regulatory complexities, currently requiring permits and authorisations from a number of different authorities at the national, provincial and/or local level.

The environmental legislative framework was identified as one of the key areas where improvements are possible and it is intended that the recommendations from this SEA would contribute towards the possible integration and streamlining of the current regulatory requirements to ensure that challenges can be addressed which in turn will allow the industry to grow as intended. Details of such recommendations are included in Part 4 – Decision Support Framework of this report.

1.2.4 Provide Industry Support

A key objective of the SEA process is to utilise the outcomes from the pre-assessment of various environmental and socio-economic opportunities and constraints in each of the strategic focus areas as a spatial planning tool to guide the appropriate siting of new facilities to be developed within the identified marine and freshwater aquaculture development zones (ADZs).

Another key objective is to assist the aquaculture sector in alleviating the regulatory burden and expedite decision-making within the ADZs through a streamlined authorisation process and integrated permit application process. The SEA is further to provide the aquaculture industry access to generic Biodiversity Risk and Benefit Assessments prepared for seven selected aquaculture species in terms of NEM:BA (2004) and in accordance with section 14 of the Alien and Invasive Species (A&IS) Regulations of 2014, and the A&IS Lists of 2016, as amended in 2018 (in draft).

The SEA is also to provide recommendations for minimum requirements when assessing potential impact of proposed aquaculture activities to marine and freshwater biodiversity and ecology when applying for environmental authorisation in terms of section 24 of the National Environmental Management Act (1998). The SEA is further to provide support to the aquaculture sector in recommending generic best management practices to effectively manage risk and mitigate impacts associated with marine and freshwater aquaculture operations.

1.2.5 Participation and Stakeholder Engagement

The SEA is developed through an extensive consultative process which included all relevant national and provincial government departments and organs of state, key stakeholders' representative of the South African aquaculture industry, research institutions and NGOs, and the general public to facilitate buy-in and commitment from the key role

players. The successful and sustainable growth of the aquaculture sector in South Africa depends on effective coordination between these parties in order to reduce barriers to the development of the industry.

Section 1.3 Legal Framework

The key pieces of legislation that governs and regulates the South African aquaculture sector, and which enable the identification and possible implementation of the aquaculture development zones (ADZs) are summarised below:

1.3.1 Marine Living Resources Act (MLRA), Act No. 18 of 1998

Marine aquaculture activities are currently mandated under the Marine Living Resources Act of 1998 (MLRA). The MLRA created a regulatory framework for the conservation of marine ecosystems, the sustainable utilization of marine living resources and the orderly access to exploitation, utilization and the protection of certain marine living resources. Even though marine aquaculture (also referred to as mariculture) is more development focus, it formed part of the activities that are regulated in terms of the MLRA due to its utilisation of the marine space and marine species. It currently continues to be regulated in the form of issuing of rights and permits, and exemptions where possible. Marine aquaculture rights are granted in terms of section 18 (1) of the MLRA while exemptions are granted in terms of section 81 of this Act, whereas permits to exercise a right or exemption are issued in accordance with section 13 (1) of the MLRA.

1.3.2 National Environmental Management Act (NEMA), Act No. 107 of 1998

NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance, and procedures for coordinating environmental functions exercised by organs of state.

Marine and freshwater aquaculture operations trigger a number of identified activities under NEMA's Environmental Impact Assessment (EIA) Regulations of 2014, as amended. Aquaculture activities mainly require a Basic Assessment (BA) process; however, depending on the location, nature and extent of the proposed development activities, a comprehensive Scoping and Environmental Impact Assessment (S&EIR) process may be required.

This SEA is undertaken in terms of section 24(2) of NEMA which allows for the identification of geographical areas (e.g. ADZs) based on environmental attributes, and specified in a spatial development tool adopted in the prescribed manner by the competent authority, in which specified activities may not commence without environmental authorisation from the relevant competent authority. Sensitivity maps prepared as part of the SEA process give effect to section 24(3) of NEMA that allows for the compilation of assessed information and maps that specify the attributes and sensitivities of the receiving environment that need to be taken into consideration for decision-making by all competent authorities.

Section 24(7) of NEMA further allows for the provision of procedures stipulating the minimum requirements for the investigation, assessment and communication of the potential impact of proposed marine and freshwater aquaculture activities on the environment when applying for environmental authorisation.

1.3.3 National Environmental Management: Biodiversity Act (NEM:BA), Act No. 10 of 2004

Section 52 of NEM:BA allows for the declaration of ecosystems that are threatened or in need of protection and of processes that are regarded as threatening to the receiving aquatic, marine and terrestrial ecosystems. In terms of Listing Notice 3 (GN No. 324) of the NEMA EIA Regulations of 2014, as amended, the clearance of 300 m^2 or more of indigenous vegetation (activity 12) due to the proposed development of a land-based aquaculture facility located, for example, within any critically endangered or endangered ecosystem, or a critical biodiversity area, will trigger the requirement for a BA in terms of section 24 of NEMA, 1998. Furthermore, a BA will also be required when activity 30 in Listing Notice 1 (GN No. 327) of these regulations is triggered.

1.3.4 Alien and Invasive Species Regulations (A&IS) of 2014

In terms of regulation 18 of the Alien and Invasive Species (A&IS) Regulations of 2014 (GN No. 598) and the A&IS Lists of 2016, (GN No. 864), as published in terms of section 87(a) and section 97(1) of NEM:BA, no person may carry out restricted activities and/or import any alien or declared invasive species into South Africa from outside the country without a permit. Also, in terms of section 89 of NEMBA the issuing authority may in writing requires the applicant to furnish it with an independent risk assessment or expert evidence in accordance with regulation 14 of the A&IS Regulations in support of an application before issuing the permit.

1.3.5 National Environmental Management: Integrated Coastal Management Act (ICMA), Act No. 24 of 2008

The NEM:ICMA is to ensure that development and the use of natural resources within the coastal zone is socially and economically justifiable and ecologically sustainable. The NEM:ICMA does not require site specific approval but it has relevance with respect to the selection of development sites in that it deals with the preparation of estuary management plans as per section 34 of the Act. If an aquaculture development is proposed in an area subject to such a plan, engagement with relevant estuary forums is required for mutual benefit, and the standards and/or guidelines contained in an estuary management plan need to be complied with. Also, restrictions in terms of defined coastal management lines (or setback lines) could affect the development of aquaculture facilities sited between the sea and coastal setback lines as per section 25 of the NEM:ICMA.

Section 69 of the NEM:ICMA further states that no person is allowed to discharge effluent from a source located on land into coastal waters. The Minister, however, may issue a general discharge authorisation that would allow the discharge of effluent into coastal waters, or after consultation with the Minister responsible for water and sanitation, discharge into estuaries. This general discharge authorisation would need to be gazetted and would apply to persons in general or to a specific category of persons. If there is no general authorisation for discharge, then any person wishing to discharge effluent into coastal waters must apply for a coastal waters discharge permit from the National Department of Environment, Forestry and Fisheries (now DEFF, previously the DEA).

Further instruments under the NEM:ICMA which have relevance for the aquaculture industry include provincial coastal management programmes that contain specific objectives for coastal areas within a province's jurisdiction; controlling the use of vehicles within the coastal zone, and the management of public launch sites in the coastal zone.

1.3.6 National Water Act (NWA), Act No. 36 of 1998

Water use is key to any freshwater aquaculture farm and is mandated in terms of section 21 of the NWA. Water uses associated with aquaculture typically include taking water from a water resource i.e. abstraction, storing water, diverting the flow of water into a watercourse, discharging wastewater and altering the bed or banks of a water course.

Depending on the type of water source, scale of operation and the quantity of water required for an aquaculture farm, an application for a general authorisation (GA) – should the water use fall within the thresholds of a GA – or a water use license (WUL) is required. Applications for water use authorisation are lodged with the now National Department of Human Settlement, Water and Sanitation (DHSWS).

1.3.7 The Aquaculture Development Bill of 2018

During 2014, the then Department of Agriculture, Forestry and Fisheries (DAFF) has embarked on a process of developing aquaculture legislation to promote responsible and ecologically, socially and economically sustainable aquaculture development in South Africa. The Aquaculture Development Bill was referred to industry and other

relevant stakeholders throughout the country for review and comment, after which it was introduced to Parliament on 22 June 2018.

Objectives of the Aquaculture Development Bill are to establish an Intergovernmental Authorisations Committee; to provide for the establishment of a national aquaculture intergovernmental forum; to provide for the establishment of provincial aquaculture intergovernmental forums; to provide for the establishment of the national aquaculture sector liaison forum; to provide for the appointment of aquaculture extension officers; to provide for the appointment of specialists on contract; to provide for the recognition of aquaculture sector associations; to provide for the establishment of a national reference laboratory for aquatic animal diseases and food safety; to provide for the establishment of national and provincial aquaculture development funds; to provide for the adoption and content of national and provincial aquaculture development strategies; to provide for the establishment of aquaculture development zones; to provide for the establishment of national and provincial aquaculture information systems; to provide for licensing authorities; to provide for the application, transfer, amendment, renewal and cancellation of aquaculture licenses and permits; to provide for integrated aquaculture authorisations; to provide for the setting of water quality objectives and standards for aquaculture; to provide for the protection of the aquatic and marine environment; to provide for the development of a national aquatic and marine animal health programme relating to health, welfare, safety and quality of aquatic and marine organisms and products; to prohibit the import, export and movement of aquaculture organisms and products without permits; to provide for the transformation of the aquaculture sector; to provide for the designation of aquaculture inspectors; to provide for the powers of aquaculture inspectors; to provide for offences and penalties; to provide for appeals; to provide for ownership of aquaculture organisms and products; to provide for delegation; to provide for the making of regulations; to provide for savings, repeal and amendment of legislation; to provide for transitional arrangements; to limit state liability; and to provide for matters connected therewith.

1.3.8 Infrastructure Development Act (IDA), Act No. 23 of 2014

The objects of the Infrastructure Development Act, 2014 are to provide for — (a) the existence of the Presidential Infrastructure Coordinating Commission and its structures which must perform the functions provided for in this Act; (b) the identification and implementation of strategic integrated projects which are of significant economic or social importance to the Republic or a region in the Republic or which facilitate regional economic integration on the African continent, thereby giving effect to the national infrastructure plan; (c) the alignment and dedication of capabilities and resources for the effective implementation and operation of strategic integrated projects across the state in order to ensure coherence and the expeditious completion of infrastructure build and maintenance programmes; (d) the appointment of relevant Ministers to chair strategic integrated projects; (e) the establishment, appointment and functioning of steering committees to provide technical support and oversight for strategic integrated projects; (f) processes and periods of time applicable to the implementation of strategic integrated projects; (g) a statutory instrument by which any approval, authorisation, license, permission or exemption required in terms of other legislation can be facilitated and expedited; (h) a statutory instrument by which obstacles to the expeditious implementation of the national infrastructure plan can be unblocked; and (i) generally, practices and procedures which seek to ensure that infrastructure development is not undertaken merely in a transactional manner, but in a manner which seeks to advance national development goals, including local industrialisation, skills development, job creation, youth employment, small business and cooperatives development, broad-based economic empowerment and regional economic integration. Any person exercising a power in terms of this Act must do so in a manner that is consistent with the Constitution and, in particular, with the functional competences of the different spheres of government.

Other important and relevant pieces of South African legislation that govern and regulate various aspects of the aquaculture sector include, but is not limited to the following:

<u>National</u>

- The National Environmental Management: Protected Areas Act, Act No. 10 of 2003;
- The National Environmental Management: Waste Act, Act No. 59 of 2008;
- The National Heritage Resources Act, Act No. 25 of 1999;
- The Spatial Planning and Land Use Management Act, Act No. 16 of 2013;
- The Marine Spatial Planning Act, Act No. 16 of 2018;
- The Maritime Zones Act, Act No. 15 of 1995;
- The Sea Birds and Seals Protection Act, Act No. 46 of 1973;
- The Seashore Act, Act No. 21 of 1935;
- The Genetically Modified Organisms Act, Act No. 15 of 1997;
- The Health Act, Act No. 63 of 1977;
- The Foodstuffs, Cosmetics and Disinfectants Act, Act No. 54 of 1972;
- The Medicines and Related Substances Act, Act No. 101 of 1965;
- The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, Act No. 36 of 1947;
- The Conservation of Agricultural Resources Act, Act No. 43 of 1983;
- The Agricultural Pests Act, Act No. 36 of 1983;
- The Animals Protection Act, Act No. 71 of 1962;
- The Animal Diseases Act, Act No. 35 of 1984;
- The Animal Improvement Act, Act No. 62 of 1998;
- The Animal Health Act, Act No. 7 of 2002;
- The Water Services Act, Act No. 108 of 1997;
- The National Regulator for Compulsory Specifications Act, Act No. 5 of 2008;
- The Standards Act, Act No. 8 of 2008;
- The Draft National Inland Fisheries Policy Framework for South Africa of 2018;
- The National Aquaculture Policy Framework of 2013; and
- The National Aquaculture Strategic Framework of 2012.

<u>Provincial</u>

- The Free State Nature Conservation Ordinance No. 8 of 1969;
- The Boputhatswana Nature Conservation Act, Act No. 3 of 1973;
- The Cape Nature and Environmental Conservation Ordinance No. 19 of 1974;
- The Prevention of Environmental Pollution Ordinance No. 21 of 1981;
- The Transvaal Nature Conservation Ordinance, No. 12 of 1983;
- The Land Use Planning Ordinance No. 15 of 1985;
- The Animal Diseases Act (former Ciskei), Act No. 21 of 1986;
- The Ciskei Nature Conservation Act, Act No. 10 of 1987;
- The Land Use Regulation Act (former Ciskei), Act No. 15 of 1987;
- The Transkei Environmental Conservation Decree No. 9 of 1992;
- The KwaZulu-Natal Nature Conservation Management Act, Act No. 9 of 1997;
- The Mpumalanga Nature Conservation Act, Act No. 10 of 1998;
- The Northern Cape Planning and Development Act, Act No. 7 of 1998;
- The Western Cape Nature Conservation Board Act, Act No. 15 of 1998;
- The Western Cape Nature and Environmental Conservation Ordinance Amendment Act, Act No. 8 of 1999;
- The Western Cape Nature Conservation Law Amendment Act, Act No. 3 of 2000;
- The Limpopo Environmental Management Act, Act No. 7 of 2003;
- The KwaZulu-Natal Planning and Development Act, Act No. 6 of 2008;
- The Northern Cape Nature Conservation Act, Act No. 9 of 2009;
- The Western Cape Biosphere Reserves Act, Act No. 6 of 2011;
- The Draft Gauteng Nature Conservation Bill of 2014;
- The Western Cape Land Use Planning Act, Act No. 3 of 2014;
- The North West Biodiversity Management Act, Act No. 4 of 2016;
- The Draft Western Cape Biodiversity Bill of 2019;
- The Draft Eastern Cape Environmental Management Bill of 2019.

Section 1.4 Approach and Methodology

1.4.1 Context of the SEA

The SEA process provides a link between the spatial context and non-spatial national- and provincial level policies, plans and frameworks, and individual aquaculture projects. The SEA specifically aims to provide strategic spatial guidance in terms of optimal project-level planning and siting, and promote investment in areas of low to medium environmental sensitivity through the identification of strategic focus areas i.e. aquaculture development zones (ADZs) to which spatial planning can be aligned for the effective, efficient and sustainable development of appropriate small- and large scale marine and freshwater aquaculture projects.

It is important to note that the SEA process is undertaken at a strategic level and cannot replace the requirement for site-specific environmental assessment. The high level, and in many cases limited or even lacking, environmental, social and economic data considered to identify and pre-assess the strategic focus areas (or ADZs) is not sufficient for project-level i.e. site specific decision-making, and will require ground-truthing of proposed development sites for both marine and freshwater aquaculture prior to application for environmental authorisation.

The pre-assessment undertaken in the SEA process does however enable recommendations exploring the possibility for integrated and streamlined implementation of national and provincial legislation in support of faster decision-making and more coordinated permitting procedures.

1.4.2 Extent of SEA

The extent of the assessment for both marine and freshwater aquaculture for purposes of this SEA was at a national strategic level.

In terms of marine aquaculture, eight strategically selected focus areas representative of all four coastal provinces of South Africa, namely Eastern Cape, Northern Cape, Western Cape and KwaZulu-Natal, were pre-assessed.

For freshwater aquaculture, nine strategically selected focus areas were assessed that are representative of all nine South African provinces, namely Gauteng, Free State, KwaZulu-Natal, Limpopo, Mpumalanga, North West, Eastern Cape, Northern Cape and Western Cape.

1.4.3 Scope of the SEA

This desktop-based SEA was conducted at a national scale and includes all nine provinces of South Africa. The SEA has identified and pre-assessed the key environmental, social and economic attributes, specific siting criteria and key generic impacts associated with both marine and freshwater aquaculture activities relating to planning, development / construction and operations.

The SEA has considered natural (i.e. offshore, nearshore and instream) and land-based aquaculture production systems operating in cold/temperate and warm waters.

Candidate species that were assessed in this SEA include shellfish (i.e. abalone, Mediterranean mussel and Pacific oyster), marine finfish (i.e. dusky kob and Atlantic salmon), and freshwater finfish (i.e. Mozambique and Nile tilapia, Brown and Rainbow trout, and African sharptooth catfish), as well as freshwater Marron crayfish.

The SEA process has also conducted a review of existing and prospective aquaculture related legislation, including current requirements for licensing, permitting and authorisational procedures to gain an understanding of the legislative framework presently governing the marine and freshwater aquaculture sectors on both a national and provincial level.

It is important to note that the processing component of the aquaculture value chain was not considered or assessed in this SEA process. See Section 1.4.3.3 of this report for more detail on the aquaculture value chain.

1.4.3.1 Marine Aquaculture Environments

Offshore

Offshore aquaculture environments are defined as South African territorial marine waters within a distance of twelve nautical miles (about 22 km) from the shoreline as described in the Maritime Zones Act (Act No. 15 of 1994). “Offshore” for purposes of this SEA is thus delimited as open ocean space located more than 3 km from the shoreline, but less than 20 km along the entire South African coast.

Nearshore

Nearshore aquaculture environments are considered South African internal coastal marine waters, exclusive economic zones, the continental shelf, and natural bays and harbours as described in the Maritime Zones Act (Act No. 15 of 1994). For purposes of this SEA “nearshore” is thus defined as the coastal marine waters situated along the entire South African coast within 3 km from the shoreline.

Land-based

Land-based aquaculture is considered the farming of marine organisms in small or large land-based systems including re-circulating tanks, raceways, ponds, and flow-through tanks using pump ashore technology.

1.4.3.2 Freshwater Aquaculture Environments

Instream

Instream freshwater aquaculture environments constitute any suitable watercourse as defined in terms of the National Water Act (Act No. 36 of 1998) including rivers, natural channels in which water flows regularly or intermittently, or a wetland, lake, pond or dam into which, or from which, water flows. It is important to note that the SEA assumes no regulatory streamlining for instream aquaculture as stipulated above, except in the case of dam and pond based cage culture.

Land-based

Land-based freshwater aquaculture is considered the farming of aquatic organisms in small or large land-based systems, including raceways, ponds, re-circulating tanks, and flow-through tanks with varying freshwater throughput rates of water pumped either directly from the water source or via closed re-circulation (RAS).

1.4.3.3 Aquaculture Value Chain

The value chain for aquaculture comprises of a number of primary activities. The “input supply” stage consists of four critical elements: (i) stock supply which originates from hatcheries or nurseries, locally or abroad; (ii) the feed supply which is either imported or produced locally; (iii) the labour supply which carry out the various activities within the facilities; and (iv) sufficient quality and quantity of water supply (Figure 1–3).

The second stage is that of “production technology” where the technology utilised depends on the type of business enterprise to be carried out (e.g. cages, ponds or tanks), as well as the various methods of transportation and capital equipment required.

The third stage is the maturing of the species to the correct age and size for marketing, sales and distribution. This is followed by trading of the particular species, either to the local or export market. Traders will either process the species, or sell the produce to designated processors who in turn will sell it to the consumers. Supporting products and services include the research and technology element of this value chain.

It is important to note that the activities involving on-site harvesting, cleaning and live packaging of aquaculture products are included in

the scope of the SEA; however, **processing including the production of fresh and frozen products for sale to both the local and export markets are excluded from the scope of this SEA**.

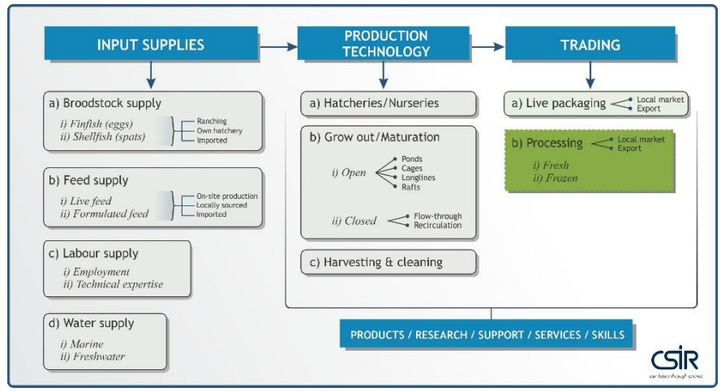


Figure 1-3: Schematic illustration of the typical South African aquaculture value chain. The green-shaded area represents processing of aquaculture products and was excluded from the scope of the SEA.

1.4.3.4 Production Systems

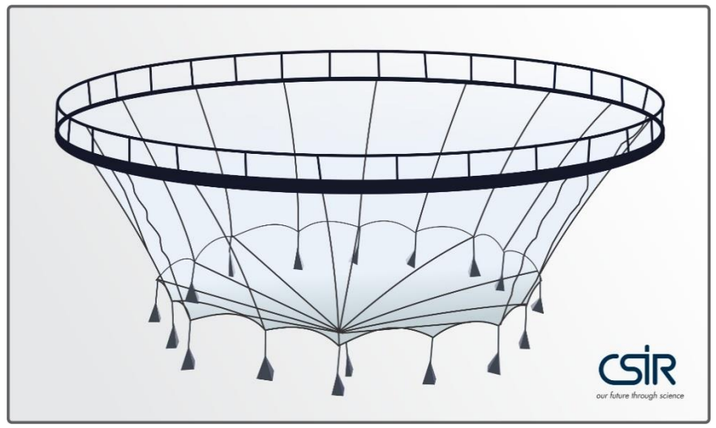
Several factors drive aquaculture development ranging from socio-economic needs such as food security, job creation and poverty alleviation, to addressing the needs of industries with particular emphasis on profits, increased productivity and consistently producing good quality and safe food products. Consequently, the requirements for sustainable aquaculture development include both technological and people based approaches.

Aquaculture systems can range from very extensive, through semi-intensive and highly intensive to hyper-intensive. Aquaculture systems can be deployed instream- or sea-based, land-based, integrated or Re-circulating Aquaculture Systems (RAS).

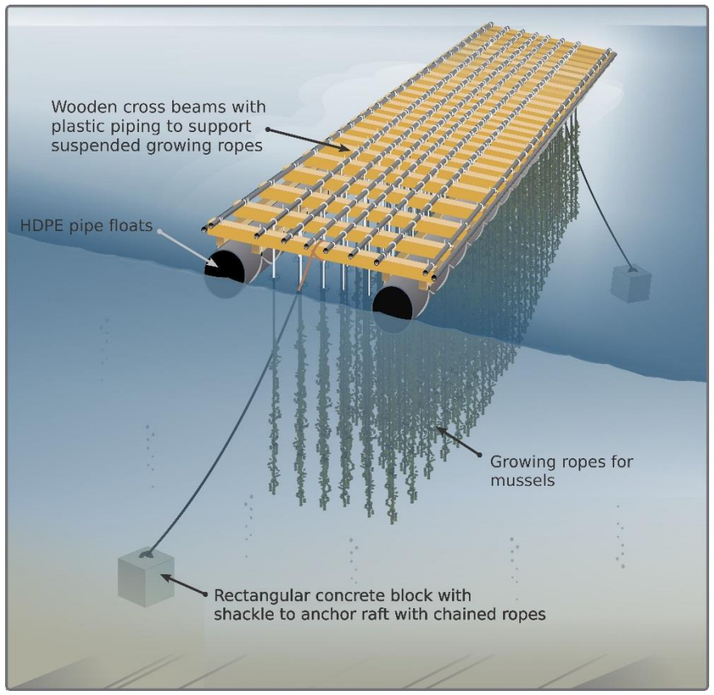
From this range of choices, the design and selection of suitable aquaculture production systems can be made based on which system most effectively meets social needs and best fits the opportunities and constraints posed by the receiving environment.

The aquaculture production systems (Figure 1-4) assessed in this SEA comprise the following:

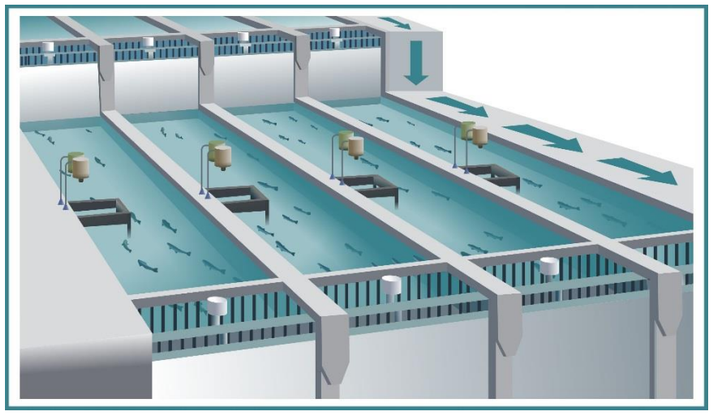
- Cage culture
- Flow-through with pump ashore technology
- Longlines, racks and rafts
- Pond culture
- Raceways, and
- Re-circulating tank culture.



Cage culture involves the placing of cages in dams, ponds, rivers or oceans to contain and protect the fish until they can be harvested. It is a rearing facility this is enclosed on both the bottom and lateral sides by wooden, mesh or net screens. It allows natural water exchange through the sides which in most cases are submerged below the cage. Cage culture is typified by floating structures made of steel, wood and/or plastic which is developed into the floating, flexible, plastic circle design cages most commonly used globally. Finfish cage culture types include nearshore gravity net cages or pens, and open water floating, submersible and/or semi-submersible cages.

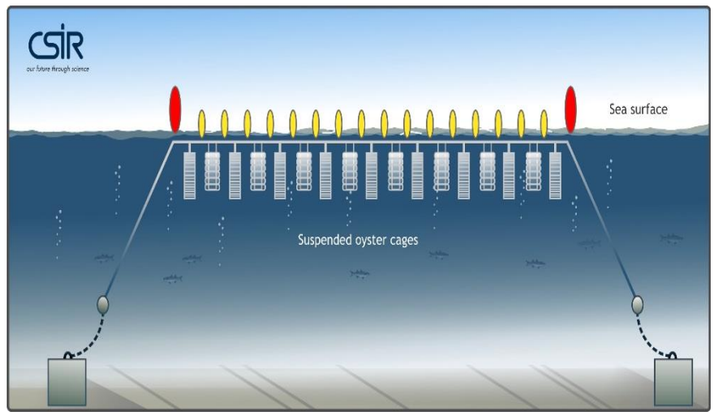


Raft culture is a form of suspended culture in which the "on-growing" structures (i.e. ropes) are suspended and submerged beneath a floating raft. Rafts utilises moored, floating structures which may consist of an old wooden boat with a system of outrigger built around it, or a catamaran-type boat carrying some 1 000 rope hangings, or just an ordinary plain wooden raft with floats and anchors. Floats can be made of plastic, wood, oil drums, etc. Rafts are mostly used for marine shellfish culture, especially mussels. The raft is transferred from one water space to another being towed by a motor boat.

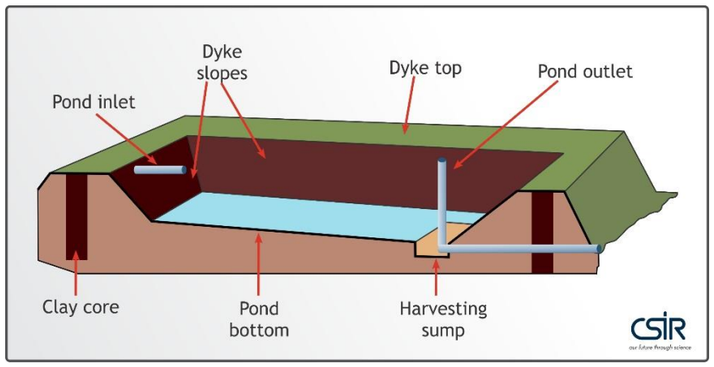


A **raceway** consists of a long and narrow canal, usually of concrete with a water inlet (diverted from a river) and outlet (through treatment plant back into river) to maintain a continuous flow of fresh water that ensure good quality water for high density production.

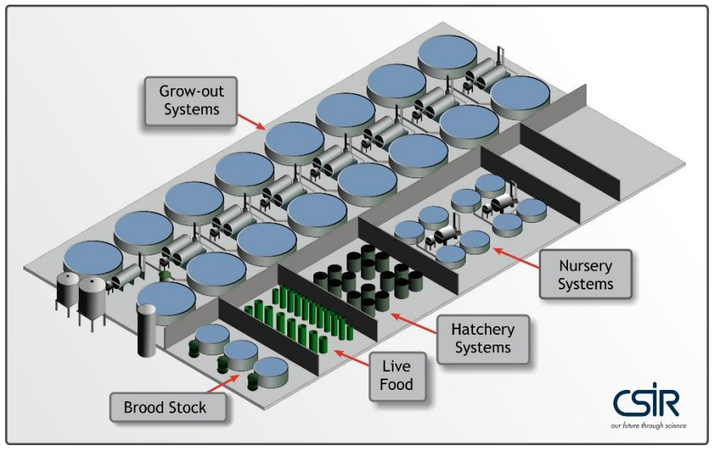
Flow-through systems are single-pass production systems where a continuous supply of water from the ocean, an estuary, a river, a storage reservoir or other water source is channelled via an inlet through tanks, ponds or channels before returning to the environment via an outlet. This system also allows for high density aquaculture production.



Longline culture is a form of open-water suspended culture in which species are grown on ropes or in containers such as baskets, stacked trays or lantern nets, which are suspended from anchored and buoyed surface or sub-surface ropes. Longlines are commonly used for the culture of bivalve molluscs including mussels, oysters, clams and scallops, as well as marine macro algae.



Pond culture is considered the simplest form of fish farming where fingerlings are stocked at low to medium densities into earthen ponds or irrigation dams lined with bentonite clay. Pond culture uses various pond designs in different stages of an aquatic organism's development, such as spawning ponds, wintering ponds, fry ponds and grow out ponds.

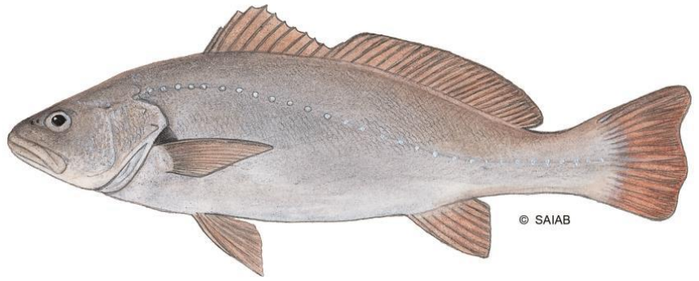


A **re-circulating aquaculture system (RAS)** is an advanced tank-based operation that involves a series of culture tanks and filters where water is continuously recycled and monitored to keep optimal conditions all year round. Water is filtered and treated biologically to neutralise harmful chemicals, while the use of UV sterilization, ozonation, and oxygen injection ensure optimal water quality. RAS dramatically reduces the quantity of water and available space required to intensify and optimize aquaculture production. The key steps in a RAS include the removal of solids, ammonia and CO^2, as well as oxygenation.

Figure 1-4: Illustration of different production systems typically used in the South African marine and freshwater aquaculture sector.

1.4.3.5 Candidate Marine Species

Salmo salar (Atlantic salmon)



Argyrosomus japonicas (Dusky kob)

Mytilus galloprovincialis (Mediterranean mussel)

Crassostrea gigas (Pacific Oyster)

Haliotis midae (Abalone)

Seaweed including (A) *Gracillaria* species, (B) *Porphyra capensis* and (C) *Ulva* species

1.4.3.6 Candidate Freshwater Species

Salmo trutta (Brown trout)

Oreochromis niloticus (Nile tilapia)

Oncorhynchus mykiss (Rainbow trout)

Oreochromis mossambicus (Mozambique tilapia)

Clarias gariepinus (African sharptooth catfish)

Cherax tenuimanus (Marron crayfish)

1.4.4 SEA Process

The SEA consisted of four distinct phases (Figure 1-6).

1.4.4.1 Phase 1 – Inception

The Inception phase consisted of an extensive literature and data review to gain an understanding of the key challenges facing the South African aquaculture sector and impacts associated with various aquaculture activities, including fish species, siting criteria and environmental attributes for consideration relating to aquaculture suitability. A legal review was conducted summarising information on the current regulatory approvals required prior to engaging in an aquaculture activity. A key finding from this review indicated a miss-alignment between biodiversity and agricultural legislation, specifically for freshwater aquaculture on a provincial level. The Inception phase also entailed the initiation of a stakeholder consultation process, convening governance structures i.e. a Project Steering Committee (PSC) and Expert Reference Group (ERG), with representation from relevant national and provincial authorities, conservation agencies, research institutions and aquaculture industry associations. Phase 1 further included launching the SEA process nationally through placement of newspaper advertisements, producing a background information document (BID) and creating a project website.

1.4.4.2 Phase 2 – Screening

Phase 2 of the SEA process involved the national-level identification and screening of spatially explicit key environmental, social and economic attributes to identify strategic focus areas optimally suitable to aquaculture development in South Africa. Multi-variate spatial analysis, in consultation with iterative expert input from government and industry stakeholders, was utilised to prioritise and refine the identified aquaculture development zones (ADZs). These ADZs were subjected to further desktop-level specialist assessment during the scientific assessment phase (Phase 3) of the SEA process.

1.4.4.3 Phase 3 – Scientific Assessment

The scientific assessment phase (Phase 3) of the SEA process involved desktop-level pre-assessments and sensitivity mapping of the 17 marine and freshwater ADZs that were identified during Phase 2 of the SEA. Multi-author teams of specialists have identified and assessed the strategic issues and key impacts/risks associated with aquaculture planning, construction and operations using the latest available datasets. The pre-assessments were undertaken considering aspects of freshwater- and marine biodiversity and ecology, including water quality and quantity, ecosystem health, biodiversity risks and pathology; archaeology, palaeontology and cultural heritage, visual and scenic aesthetics, socio-economics and effluent management.

1.4.4.4 Phase 4 – Decision Support Framework

Phase 4 of the SEA involved the collation and incorporation of key findings, sensitivity mapping and risk analyses resulting from the specialist assessments into the SEA Report. Based on the outcomes from the pre-assessments, key environmental impacts characteristic of all strategic focus areas were highlighted. Models have been developed and recommendations are provided in the SEA Report for a potential integrated authorisation and permitting process for marine and freshwater aquaculture. Recommendations for minimum requirements when assessing the potential impact of aquaculture on aquatic and marine biodiversity and ecology are also provided. A further output from Phase 4 of the SEA are generic best practice management guidelines to effectively manage risk and mitigate impacts associated with marine and freshwater aquaculture operations. The SEA Report also includes generic biodiversity risk and benefit assessments prepared for seven selected aquaculture species in terms of NEM:BA, 2004 and in accordance with regulation 14 of the Alien and Invasive Species (A&IS) Regulations, 2014 and the A&IS Lists, 2016; as amended in 2018 (in draft).

1.4.5 Risk Assessment Methodology

Each specialist assessment undertook a rigorous and systematic risk and opportunity assessment of the identified impacts relating to marine and freshwater aquaculture. The purpose of the risk assessment was to summarise the many complex interactions within a strategic issue topic into an easily understood expert assessment, and to enable integration across widely differing topics.

For this SEA process, opportunity/risk was represented as probability or likelihood of a positive or negative impact occurring as a result of aquaculture development, considered in relation to the effect or consequence of that impact (Figure 1-5), without- and with mitigation. A systematic risk assessment of the impacts relating to freshwater and marine aquaculture development allows for the consideration of potential impacts in a common way across different strategic issue topics, and (where possible) within a spatial context. The 'with mitigation' options have considered the 'best practice' management guidelines described in each specialist assessment (Appendix A).

For each strategic issue topic, consequence levels were determined and clearly defined by each individual specialist author team across the different disciplinary domains ranging from slight to extreme. This meant that all risk categories across the different topics were 'calibrated', which made them comparable, both conceptually and within a spatial context.

Risk was assessed for each key impact, within each study area and for different types of environmental attributes – e.g. the rural poor, a sensitive wetland, or an important heritage feature. The risk assessment was qualitative and based on an interpretation of existing spatial and non-spatial data in relation to the proposed activities, typically using the following categories: very low, low, moderate, high and very high. The risk categories are predefined as a set of criteria which have explained the nature and implications of the ascribed risks.

The consequence of an impact depended on three key aspects:

1) **Exposure to the impact**: The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected;
2) **The nature of the impact**: The potential occurrence of a natural or human-induced physical event or trend that may cause negative impacts such as health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources; and
3) **The vulnerability of the receiving environment**: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

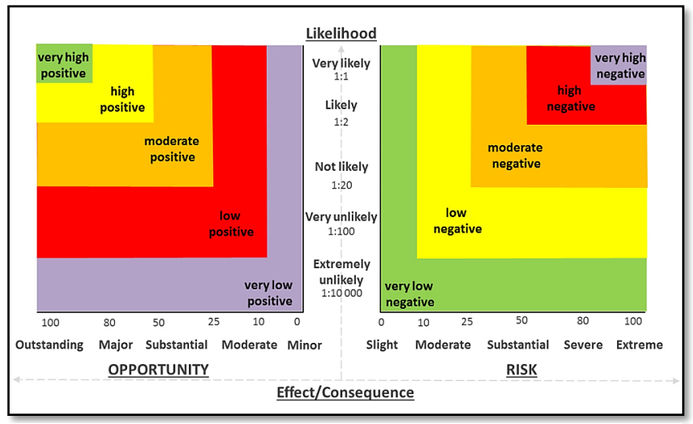


Figure 1-5: Opportunity/Risk was qualitatively measured by multiplying the likelihood of an impact by the severity of the consequences to provide risk ratings ranging from very low, low, moderate, high and very high.

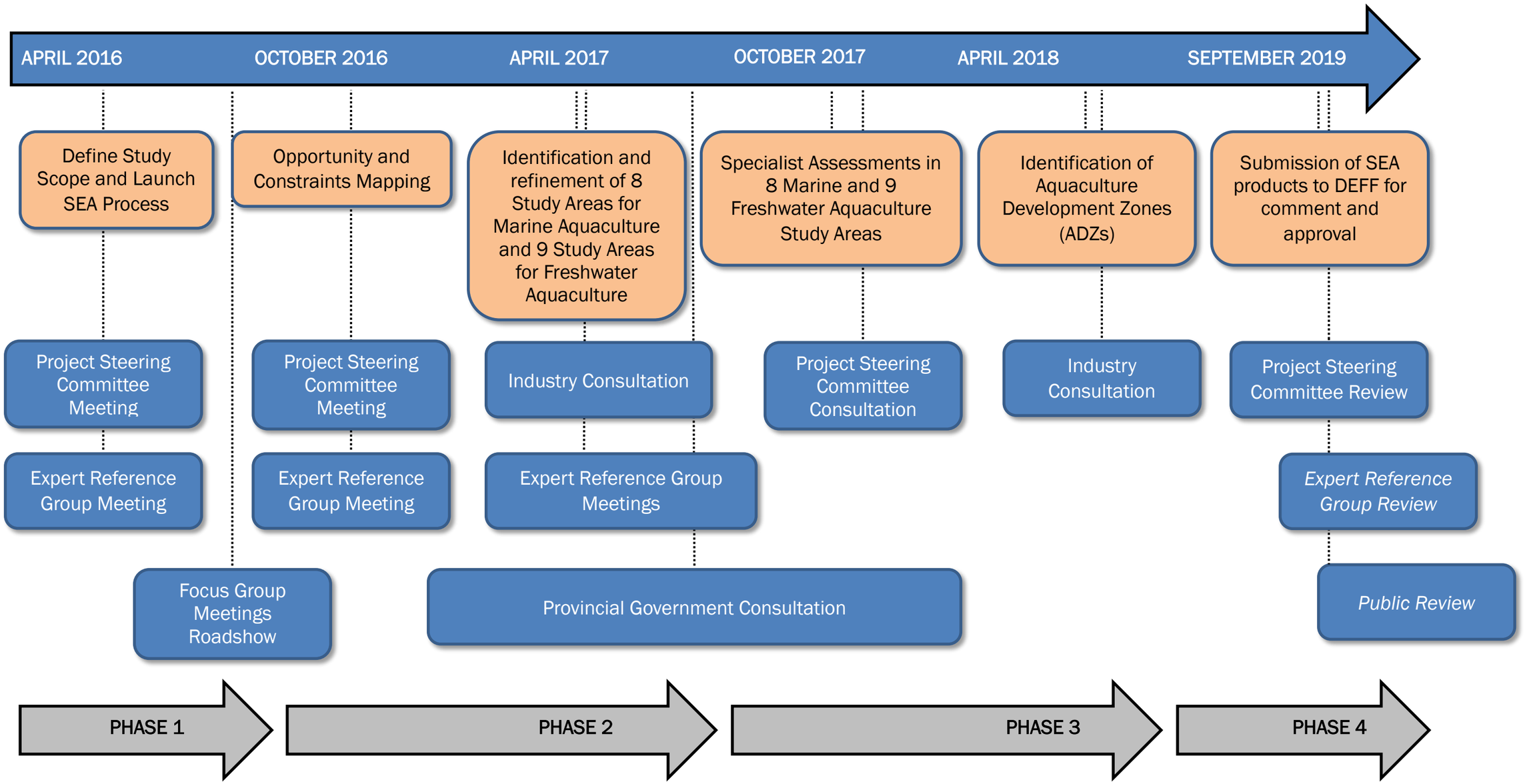


Figure 1-6: SEA Process Diagram

1.4.6 Stakeholder Consultation

A comprehensive consultation process formed the foundation for this SEA and while a brief summary is provided below, details of the stakeholder engagement process are provided in Appendix B.

The SEA process was governed by a Project Steering Committee (PSC) consisting of key national and provincial authorities relevant to marine and freshwater aquaculture development in South Africa. The process was also informed by an Expert Reference Group (ERG) consisting of key stakeholders with a focussed interest in marine and freshwater aquaculture research and development. The ERG consisted of provincial and local authorities, research institutions, academia, active NGOs and most importantly the marine and freshwater aquaculture industry. In addition, during the initial phases of the SEA when determining key technical and environmental siting criteria and identify impacts, focus group meetings were conducted at key centres around the country in order to engage with local and provincial stakeholders. The purpose of the focus group meetings was also to introduce the SEA process to relevant aquaculture stakeholders and source information on aquaculture operations and current regulation within the nine provinces, as well as to verify mapping of existing aquaculture facilities and check that all relevant environmental, social and economic issues faced by the aquaculture sector were identified and noted. Further, a dedicated SEA website where stakeholders could engage with any uploaded information, was created and maintained during the course of the SEA process. The SEA has been presented at two international and one national conferences, and more than 25 stakeholder workshops.

1.4.7 Key Assumptions and Limitations

1.4.7.1 Level of Assessment

The SEA was undertaken as a strategic level assessment that aimed at a high level, to identify focus areas i.e. aquaculture development zones (ADZs) and investigate the potential for streamlining regulatory requirements to prioritise aquaculture development in those focus areas. There is a strong focus on promoting aquaculture that is developed in an environmentally responsible manner; and although the SEA cannot replace the requirement for site-specific environmental assessment due to limited or even lacking, environmental, social and economic data in order to sufficiently pre-assess the focus areas at a strategic level, the SEA attempted to seek areas where the potential risk associated with different aquaculture production systems and –species are considered medium to low, especially very low with mitigation. The SEA has further aimed to prescribe appropriate environmental assessment and management actions in these priority focus areas where aquaculture is strategically considered acceptable; however, it is important to note that ground-truthing of proposed development sites for both marine and freshwater aquaculture prior to application for environmental authorisation will be required to verify the sensitivity of the receiving environment.

Although it is recognised that fully 'artificial' RAS systems may be employed successfully virtually anywhere in the country, the SEA assumed minimum technology / engineering input (e.g. artificial heating or cooling). Therefore, 'natural' unsuitability from a climate perspective (e.g. too cool or too hot) for a species was mainly taken into account during the study area identification process.

Aquaculture is not in any way restricted or prohibited outside of the strategic focus areas. Any person has the right to propose aquaculture development anywhere and follow the existing regulatory requirements and processes to obtain any required authorisations and licenses / permits.

Each focus area individually covered spatial scales extending over hundreds of square kilometres. The high-level, strategic nature of this assessment necessitated that it be conducted at a low spatial resolution and that it addressed ecological and socio-economic characteristics pertinent at this coarser scale. A suite of appropriate generic environmental and socio-economic indicators was identified and used across the ADZs to assess risks from typical impacts associated with marine and freshwater aquaculture. Also, the large size of the ADZs precluded fine-grained characterisation of landscape qualities, and the scale is generally too great to accurately determine the presence of built heritage elements where these exist outside of towns / city centres.

South Africa's coast offers potentially favourable environments to support marine aquaculture as many areas are subject to high current flows that create dispersive environments. Water quality impacts can therefore be mitigated by siting marine aquaculture developments in areas with naturally high assimilative capacity. While the broad scale of this SEA and lack of detailed oceanographic information precluded the identification of such areas, this should be considered in more detailed site-specific assessments.

Assessment of socio-economic impacts is inherently challenging due to the variation on the capacity of human beings to adapt to change and unexpected shocks, and is linked to diverse factors such a culture, value systems, relative income levels and physiological resilience. This level of uncertainty was compounded in this SEA in which concrete project variables (e.g. location, size, layout, employment numbers, etc.) are excluded in favour of understanding a relative geographic location's capacity to accommodate a given development. By necessary implication, high-level impact evaluation cannot provide accurate information on economic and social impacts which are strongly related to unique local contextual variables. Unsurprisingly, uncertainty is further exacerbated when the scope of the assessment encompasses vast geographic regions of a country as socio-economically diverse as South Africa.

1.4.7.2 Exclusions

The broad level of assessment in this SEA did not include any project-level assessments or ground-truthing, nor any site-specific public participation by the specialist author teams within the ADZs. The SEA assumed the use of natural surface waterbodies as water sources only and groundwater was therefore not considered as a potential water source in this SEA. The SEA also assumed no regulatory streamlining for estuaries nor instream freshwater aquaculture in rivers or streams, but did considered it for dam cage culture of certain species.

Freshwater temperature was not considered in the GIS analysis as no reliable water temperature data could be found for the country, and air temperature was not deemed to be a reliable proxy for water temperature. Temperature was considered based on stakeholder input in refining the study areas. Also, terrestrial ecosystems were not considered in the scientific assessment of the SEA, other than where "natural" land use in the surrounding catchment was used in sensitivity mapping as a surrogate indicator of likely least-impacted aquatic ecosystems.

It was initially proposed that the Ecological Target Categories for meeting gazetted Resource Quality Objectives should also inform the sensitivity mapping of freshwater ecosystems. However, these data are limited in current application and were not readily available as mappable units within the time frames of this assessment, and have thus rather been referred to in the pre-approval check-list for proposed aquaculture activities, rather than being mapped spatially.

Water quality data obtained during routine monitoring of river and dam sites located within the strategic focus areas were provided by Resource Quality Information Services (RQIS) (previously RQS, IWQS, HRI) of the Department of Human Settlement, Water and Sanitation (was Department of Water and Sanitation and previously Department of Water Affairs). Although these data were initially included in the freshwater biodiversity sensitivity layers, they are too spatially sparse to be really useful in a strategic level assessment such as this SEA, and moreover did not lend themselves to mapping at similar scales to the other variables used. There were thus excluded.

Consideration of the 'business case' in terms of development- and operating costs, as well as technical -and financial feasibility is not

within the scope of the SEA, but should be considered on a project-by-project basis, and is the responsibility of the developer / farmer proposing a specific aquaculture project.

Most importantly, the SEA did not consider potential impacts associated with onsite processing, packaging and transport, including import and export of farmed fish and fish products.

1.4.7.3 Data limitations

The assessment provided a broad scale sensitivity rating across each of the focus areas. While the specialist assessments attempted to be spatially explicit, several sensitivity indicators could only be identified as geo-referenced points as it was not possible to accurately define all sensitive areas as GIS polygons. Spatially scaled sensitivity demarcations within the focus areas would need to be refined prior to the use of the sensitivity data for aquaculture permit allocations.

One of the outputs of the freshwater biodiversity and ecology specialist assessment was the spatial mapping of sensitive aquatic ecosystems. These maps were used in the risk analysis, to determine areas where there is high confidence that impacts to aquatic ecosystems associated with aquaculture activities would be low. However, the accuracy of the spatial data used was in many cases limited by the scale at which the data are available – quaternary and sub-quaternary level data, as well as the generally low levels of ground-truthing that have informed the collation of these data. A limitation of the outputs of this assessment is thus the lack of structured, consistent ground-truthing of any of the focus areas studied. This means that sensitivity maps may over-emphasize the extent of areas of high and very high sensitivity. This limitation is an important one and can be addressed only by ground-truthing and the collection, collation and verification of more accurate data within the ADZs.

Information at the local and provincial level, in the form of heritage registers and inventories is often not retained or maintained, or, where these do exist, it is inaccessible. Also, many heritage resources appear to be inaccurately mapped or graded, and in some areas completely lacking. The specialist assessment had to rely on known heritage resources, largely as captured and mapped on SAHRIS. While this is a powerful and useful tool, not all information is captured to it, and not all information on its system is considered accurate.

A limitation that is specific to the palaeontological assessment is the lack of access to the 1:250 000 scale geological maps of the 17 focus areas. While the 1:1 000 000 maps were available and have been used for this assessment, the scale and resolution of geological layers represented on these maps is not fine-grained enough to make accurate assessments of the geology of each area, the distribution of potentially fossiliferous layers, or the likelihood of exposures of fossil-bearing strata at the surface.

Being strategic in nature, the visual aesthetic assessment made use of broad baseline information and assumed that i) more detailed 1:50 000 maps and aerial imagery would be used for local or project-level assessments; ii) scenic routes were based on knowledge of the specialist authors and therefore detailed mapping would be needed at the project-level; and iii) information on the locality of private reserves and game farms, in addition to the viewsheds of National Parks and Nature Reserves will require detailed information at the project-level.