Fisheries and Aquaculture in Oman

01 Seafood and Food Security
02 Initiatives
03 Key Market Players
04 Opportunities & Recommendations

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The Sultanate of Oman is strategically located at the mouth of the Persian Gulf and sharing border with UAE, Saudi Arabia and Yemen. It shares maritime borders with Iran and Pakistan. The coast is formed by the Arabian Sea on the southeast and the Gulf of Oman on the northeast. The Madha and Musandam exclaves are surrounded by the UAE on their land borders, with the Strait of Hormuz (which it shares with Iran) and Gulf of Oman forming Musandam's coastal boundaries.

From the late 17th century, the Omani Sultanate was a powerful empire, vying with Portugal and Britain for influence in the Persian Gulf and Indian Ocean. At its peak in the 19th century, Omani influence or control extended across the Strait of Hormuz to modern-day Iran and Pakistan, and as far south as Zanzibar. When its power declined in the 20th century, the sultanate came under the influence of the United Kingdom. For over 300 years, the relations built between the two empires were based on mutual benefits. Britain recognized Oman's geographical importance as a trading hub that secured their trade lanes in the Arabian Gulf and Indian Ocean and protected their empire in the Indian sub-continent. Historically, Muscat was also among the most important trading ports of the Indian Ocean.

The Sultan Qaboos bin Said al Said has been the hereditary leader of the country, since 1970.

Oman is a member of the United Nations, the Arab League, the Gulf Cooperation Council, the Non-Aligned Movement and the Organisation of Islamic Cooperation. It has sizable oil reserves, ranking 25th globally. In 2010, the United Nations Development Programme ranked Oman as the most improved nation in the world in terms of development during the preceding 40 years. A significant portion of its economy involves tourism and trade of fish, dates, and certain agricultural produce. Oman is categorized as a high-income economy and ranks as the 70th most peaceful country in the world according to the Global Peace Index. (Source: Wikipedia)

**Key economic indicators:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>309,500 km²</td>
</tr>
<tr>
<td>Shelf area</td>
<td>58,000 km²</td>
</tr>
<tr>
<td>Length of continental coastline</td>
<td>1,700 km</td>
</tr>
<tr>
<td>Exclusive Economic Zone</td>
<td>535,912 km²</td>
</tr>
<tr>
<td>Population (2018)</td>
<td>4.8 million</td>
</tr>
<tr>
<td>GDP at purchaser’s value (2017)</td>
<td>USD 72.6 billion</td>
</tr>
<tr>
<td>GDP per capita (2017)</td>
<td>USD 1,962</td>
</tr>
<tr>
<td>Agriculture, gross value added (2017)</td>
<td>USD 1.375 million</td>
</tr>
<tr>
<td>Fisheries, gross value added (2016)</td>
<td>USD 585 million</td>
</tr>
</tbody>
</table>
OMANS FISHERIES LEGACY

The Sultanate of Oman’s fisheries and aquaculture resources are a source of considerable prosperity for all Omanis. Before oil was discovered in the 1960s, 80 percent of the population lived from agriculture and fishing.

The current fisheries industry is not economically productive and the aquaculture industry is in its infancy. However, the government regards the sector as one of the five main economic pillars for the future together with natural gas; construction; trade and tourism. The world bank conservatively estimates that Oman is forgoing 6 billion US$ from fisheries under current management of the sector, and in 2015 developed a comprehensive Fisheries and Aquaculture Vision for the next 25 years development.

The Fisheries and Aquaculture Vision 2040 set target of over 220,000 tons fish production per year, contribution of 500-900 million US$ to the economy and adding 11,000 jobs by 2040. (World Bank 2015).

80% of growth through private sector, including foreign investment (MOAF)
The Omani government aims to transform the fisheries and aquaculture industry from a currently subsidies sector to a significant contributor to Oman’s economy and exports. According to the Fisheries and Aquaculture Vision 2040 the sector should contribute net at least 500-900 million US$ by 2040.

Compared to other countries in Middle East, Oman has significant competitive advantages making fisheries and aquaculture a rational focus for investment and development:

- 3,165 km of pristine coastline abundant with sea life, including international large tuna resources.
- Shallow continental shelf (10-20km in places) offering easy access to cold water for land-based aquaculture.
- Large pool of experienced fishermen and – with proposer education facilities – young and skilled workers.
- Proximity to huge and growing markets for seafood (Middle East, India, East-Africa).

**FIGURE 2**

Oman’s Fisheries production (thousand metric ton) (Source: FAO 2017)

Commercial fish production in Oman began in 2003 with the production of gilthead seabream representing 89 percent of the total. In 2004, aquaculture production was valued at USD 2.5 million. The gilthead seabream represented about 82 percent of the total production value. Production of shrimp started from 2007 with total production of 85 ton and dominates the aquaculture production as the production from finfish stopped in 2007.

There are currently 21 integrated tilapia farms, one shrimp farm one marine cage farm in Oman.

Most of the aquaculture production is sold in the local markets as fresh shrimp and tilapia. (FAO 2017)
In 2013, the Minister of Agriculture and Fisheries (MAF) announced USD 1.29 billion in fisheries development between 2013 and 2020. USD 1.6 billion has been allocated by the government for development of fisheries infrastructure and domestic fish markets, ports, for expanding the fleet and subsidizing pisciculture and training, processing and development of overseas export markets. In addition, USD 259 million has been pledged in the 8th five-year plan.

**Areas suitable for aquaculture in Oman.**

**Zone 7 - Musandam** – Cage and long-line sites for marine species

**Zone 6 - Al-Batina and Muscat** – Potential for offshore aquaculture of marine finfish and seaweed/shellfish and onshore RAS/hatchery projects

**Zone 5 - Al-Sharqiya** – Shore sites for Shrimp and RAS marine fin fish projects

**Zone 4 - Barr Al-Hikman** – Potential for large area suitable for aquaculture development along Omani coastline

**Zone 3 - Masirah** – Potential for cages and long-lines

**Zone 2 - Al-Wusta** – Shrimp farming

**Zone 1 - Dhofar** – Abalone and marine fin fish

*Source: Oman Aquaculture Development Company, 2018*

In 2010, the MAF published a comprehensive study of the aquaculture site prospects in Oman. The "Atlas of Suitable Sites for Aquaculture Projects in Oman" identified the 7 areas listed above and comprises comprehensive information on various key themes along with satellite images essential to the development of aquaculture industry in the Sultanate. Among these themes are:

- **importance of aquaculture site selection,**
- **oceanographic and environmental descriptions of the nation’s coastline using satellite imagery,**
- **brief history of aquaculture production,**
- **identification of potential constraints,**
- **types of aquaculture and species suitable for Oman,** and
region-specific oceanographic features, environmental characteristics and constraints, and survey results of various factors.

The table below is an overall estimation of the aquaculture production potential across the various zones/regions, species and technologies.

![Table 10.1 - Number of sites, system use and potential tonnage of production through aquaculture by species and zone projected over the next 15 years.](image)


In 2014, the government initiated the Agriculture and Fisheries Development Fund (AFDF) that has awarded a total of 24 projects by 2018. Five projects are under development with a total production objective of 13,100 tons. The awards for the remaining 19 projects are un-realized licenses for aquaculture projects totaling investment of around USD 330 million.
OMAN INVESTMENT FUND (OIF) – AQUACULTURE (2/3)

OADC Projects: Marine Fin Fish Farming/Hatcheries

1. Project Name: Qurayat Marine Cage Fin Fish Farming
   - Production: 3,000 tons/year
   - Contribution to GDP: OMR 2m
   - Investment: OMR 2.7m
   - Job opportunities: 89
   - Status: Operational

2. Project Name: Dhabab Marine Cage Fin Fish Farming
   - Production: 3,000 tons/year
   - Contribution to GDP: OMR 2m
   - Investment: OMR 2.7m
   - Job opportunities: 76
   - Status: Planning Stage (Licenses Obtained)

3. Project Name: Bimmah Marine Tuna Ranching
   - Production: 3,000 tons/year
   - Contribution to GDP: OMR 2m
   - Investment: OMR 2.7m
   - Job opportunities: 76
   - Status: Planning – Studies Stage

4. Project Name: Ras Abu Dawood Cage Fin Fish Farming
   - Production: 3,000 tons/year
   - Contribution to GDP: OMR 2m
   - Investment: OMR 2.7m
   - Job opportunities: 89
   - Status: Planning – Studies Stage

5. Project Name: Al Bustan/ Sur Marine Cage Fin Fish Hatchery
   - Production: 35,000,000 Juveniles
   - Contribution to GDP: OMR 2.8m
   - Investment: OMR 1.1m
   - Job opportunities: 179
   - Status: Planning – Studies Stage


OMAN INVESTMENT FUND (OIF) – AQUACULTURE (3/3)

OADC Projects: Shrimp Aquaculture

1. Project Name: Qurum Shrimp Project
   - Production: 4,700 tons/year
   - Contribution to GDP: OMR 4.6m
   - Investment: OMR 14.2m
   - Job opportunities: 284
   - Status: Under Construction

2. Project Name: Khuwemah Shrimp Project
   - Production: 3,400 tons/year
   - Contribution to GDP: OMR 3.6m
   - Investment: OMR 11.3m
   - Job opportunities: 176
   - Status: Planning – Studies Stage

3. Project Name: Al Hikman Shrimp Project
   - Production: 43,000 tons/year
   - Contribution to GDP: OMR 25.9m
   - Investment: OMR 153m
   - Job opportunities: 2,521
   - Status: Initial Licensing

4. Project Name: Al Jazar Shrimp Project
   - Production: 17,700 tons/year
   - Contribution to GDP: OMR 16.9m
   - Investment: OMR 59.5m
   - Job opportunities: 825
   - Status: Planning – Studies Stage

Oman Aquaculture Development Company (www.oadc.com):
The Oman Aquaculture Development Company (OADC) was founded in 2014 as a subsidiary of the country's sovereign wealth fund, Oman Investment Fund, to direct investment in fisheries projects, and cultivate foreign investors and expertise. OADC invests in local greenfield aquaculture farming projects with the aim of leading the development of the sector within the Sultanate, including farming of shrimp, finfish, shellfish and seaweed ventures. The company is also committed to the investment in the establishment of support industries to the aquaculture farming sector, including hatcheries and feed factories.

Blue Waters Company (www.bluewaters.om):
The Blue Waters Company, a subsidiary of OADC, was established to commercially investing & developing Oman's fin fish aquaculture sector. The
objective is through internal and external expertise adopt best in class aquaculture technology and processes in Oman.

Interest in investment covers: Marine Fin Fish Cage Farms, presently with a capacity of 3,000 tons annual production; Modern Processing, Packaging and Logistic facilities; Marine Fin Fish Hatchery, with a production capacity of 15,000,000 juvenile per year and in general establishment of support industries to the fish farming sector, including Hatcheries and Feed Factories.

Projects:

- Offshore aquaculture development in Qurayyat capable of producing 3000 tons of koffer fish (long-finned sea bream), worth 7.8 million US. The first stage of the project, which cost US$6.5 million, saw the installing of 32 aquaculture cages, of which 16 are 20 meters in diameter. Fish will be grown for 12-14 months until they are ready to harvest at a size of 400-500 gram. The second stage in Bima village in the wilayat of Qurayyat will have 32 cages of different sizes that will produce 3,000 tonnes of fish per annum. The third stage in Dhabab village in the wilayat of Qurayyat will have 32 cages that will produce 3,000 tonnes of fish per annum. The production targets local and foreign markets. The facility – built in a 1.7m-sq-metre area allotted by the Ministry of Housing in 2016 – will also include a land-based factory for processing and packing fish, and a unit for producing fish feed.
- Finfish Hatchery in Al Bustan. Construction to commence 2019 (15 Mn juveniles production of Seabream)
- Marine Cage Farm in Dhabab. Site allocated; Construction commencing 2019.
- Marine Cage Farm in Ras Abu Dawood. Site allocated; in process for final license
Oceanic Shrimp Aquaculture LLC

Also a subsidiary of OADC, Oceanic Shrimp Aquaculture is developing shrimp aquaculture projects, processing facilities, product development, branding and establishing marketing network. The company is engaged in identifying suitable sites for shrimp aquaculture along Oman’s coastline, plan projects following best international standards, analyze technical and financial feasibility of the proposals, invest and manage project development. OSA intend to collaborate with technical partners globally to bring in the state-of-the-art technology to ensure bio-secure and sustainable development.

Projects:

- Natural Shrimp Aquaculture LLC: A semi-integrated intensive shrimp farm at Qurun in partnership with Arabian Marine Development LLC. The project, covering an area of 500 ha, is designed to produce 3600 tons of shrimp per annum. The project components will include shrimp maturation unit, hatchery unit, nursery units, grow out facilities and support infrastructure. The project is scheduled to be in production by last quarter of 2019.
- Oriental Shrimp Aquaculture LLC: A semi-integrated shrimp intensive shrimp farm at Khuwemah in partnership with Phoenix National. The project is designed to produce 2900 tons of shrimp per annum. Major
elements of the project are shrimp hatchery unit, nursery units, grow out facilities and support infrastructure. The project is scheduled to be in production by first quarter of 2020.

Oceanic Shrimp Aquaculture is planning an integrated shrimp aquaculture project with hatcheries, nurseries, grow-out facilities and processing and storage facilities at Al Jazar, in al Wusta Governorate. Over an area of 2,400 ha, the production capacity is 23,400 ton/yr. The project is under site investigations and is expected startup in 2021.

**Five Oceans:**
In May 2017 local firm Aljazeera Investment signed a OR12m ($31.2m) deal with domestic fishing company The Five Oceans to develop a 300,000-sq-metre aquaculture project producing abalone and hamour on the Shalim and Al Halaniyat Islands. Later that year, the ministry approved a commercial license for the project, which now has a budget of USD 116.9 million to begin production in 2020.

**Planning phases:**
- Project in Jalan Bani Bu Ali to produce 4500 tons of white prawns
- Project in Sur producing 600 tons per year of barramundi.
- The New Duqm Fisheries Industrial Zone, worth USD 250 million, which is currently in tender phase, to be completed partially by 2017 and completely by 2018. The target in Duqm is to farm 1500 tons of grouper and 1000 tons of sea cucumber.

**Research and Development Projects:**
The following ongoing research and development projects is administered under Ministry of Fisheries:

- Abalone aquaculture which aims to develop novel hatchery technologies and to examine the potential of enhancing the natural fishery;
- Sustainable aquaculture development in Musandam Governorate;
- Geographic Information System (GIS) based approach, which concentrate on the use GIS as a tool for selecting the suitable sites for cage aquaculture in Musandam Governorate;
- Development of marine cage demonstration farm in Musandam, which focus on the development of small demonstration cage farms for local fishermen association in Musandam;
- Development of feed ingredients for aquaculture sector;
- Second phase of the project for development of integrated tilapia aquaculture.

**RAS systems based on deep (cold) water utilization.**
Some developers are considering utilizing the deep and cold water accessible off the continental shelf of Oman for RAS (Recirculating Aquaculture Systems) technology for e.g. Atlantic salmon and other non-indigenous and high value species. Oman has a unique natural advantage with its at places very narrow continental shelf – some places less than 20km as illustrated next page. Pumping cold water drastically reduces the energy/cooling cost of RAS and could lay the foundation for profitable non-indigenous fish species production for the middle east markets.
Areas of narrow continental shelf – proximity to deep and cold water.
The blue color shows water depth of > 900 meters and with water temperature of 5-7 degrees centigrade.
(Source: Bluerise BV and http://map.openseamap.org/)
MAJOR AQUACULTURE PLAYERS IN OMAN

The following organizations are involved in the development of the aquaculture sector in Oman:

TABLE I: Main governmental and institutional stakeholders:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Role</th>
<th>Website/contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Agriculture and Fisheries</td>
<td>Has singled out aquaculture – commercial fish farming – as a priority segment for investment, creating opportunities for food businesses, investors and consultancy services. The ministry has identified a pipeline of 24 projects worth USD 2.2bn to develop the segment which, if carried out, would produce 293,000 tonnes of fish per year.</td>
<td><a href="http://www.maf.gov.om">www.maf.gov.om</a>, Director Dawood Suleiman AlYahayai, Aquaculture Development Directorate</td>
</tr>
<tr>
<td>Ministry of Foreign Affairs</td>
<td>Facilitates and promotes international relations</td>
<td><a href="http://www.mofa.gov.om">www.mofa.gov.om</a>, Talal Al-Aulaqi, Office of Science and Technology</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oman Aquaculture Development Co.</td>
<td>100% owned by Oman Investment Fund. OADC was formed to commercially invest and develop aquaculture sector in Oman</td>
<td><a href="http://www.oadc.com">www.oadc.com</a>, Saoud Hamood Al-Habsi, General Manager</td>
</tr>
<tr>
<td>The Research Council</td>
<td>The Research Council is Oman’s exclusive research funding body and leader of research development in the country. TRC serves as a focal point and hub dedicated to promoting and supporting research, scientific enquiry, and innovation.</td>
<td></td>
</tr>
<tr>
<td>Aquaculture Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sultan Qaboos University</td>
<td>The department of Marine Sciences and Fisheries has 12 dedicated staff focusing on fisheries and aquaculture.</td>
<td>Wenresti Gallardo, Associate Professor</td>
</tr>
<tr>
<td>Oman Investment Fund (OAI)</td>
<td>The Sovereign Wealth Fund of Sultanate of Oman Investing in commercially attractive opportunities which have the potential to develop Oman’s economy. Aquaculture has been identified as a core sector.</td>
<td></td>
</tr>
<tr>
<td>Company</td>
<td>Description</td>
<td>Website/contact</td>
</tr>
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<td>-----------------------------</td>
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<td></td>
</tr>
<tr>
<td>Al-Hosn Investment Co.</td>
<td>HIC investments target vital economic sectors including healthcare, education, <strong>aquaculture</strong>, industrial and manufacturing, telecom / media / technology. HIC currently focuses on Private Equity and Venture Capital Investments.</td>
<td><a href="http://www.alhosnoman.com">www.alhosnoman.com</a> Osam...</td>
</tr>
<tr>
<td>Deep Sea Solutions Llc</td>
<td>Focus on the harvesting and production of deep ocean water for commercial use. The mandate is to be a deep ocean water provider and sell on a cubic metre basis or in a finished bottle product. Deep Sea Solutions will develop deep ocean water &amp; power production &amp; delivery systems. The Sultanate of Oman has deep ocean geological structures (800-2500 meters deep) relatively close to the foreshore areas along 80% of its coastline.</td>
<td>Michael Katz, CEO</td>
</tr>
<tr>
<td>Five Oceans Environmental Services LLC</td>
<td>Environmental consultancy and conservation organization located in Oman, UAE and the UK.</td>
<td>Simon Wilson, Technical Director</td>
</tr>
<tr>
<td>AquaSite AS</td>
<td>Norwegian initiative. License and concession for RAS-based farming of Atlantic salmon. Utilizing cold water pumped from deep water off the continental shelf.</td>
<td>Henno Grennes, CEO</td>
</tr>
<tr>
<td>Oman Pelagic</td>
<td></td>
<td>Dawood S. Al-Wahaibi, CEO</td>
</tr>
<tr>
<td>Cefas</td>
<td>UK based consultancy, engaged in the governmental UK-Gulf Marine Environment Partnership Programme.</td>
<td>Will Le Quesne, Middle East Programme Leader</td>
</tr>
<tr>
<td>Aljazeera Investment</td>
<td>Aljazeera Investment Company and The Five Oceans Company investing RO12mn to develop one of the biggest abalone farming projects in the sultanate. Operation from 2020.</td>
<td>Dawood bin Sulaiman al Wahibi, CEO</td>
</tr>
<tr>
<td>The Five Oceans Company</td>
<td>Five Oceans Co LLC is a 100% Omani Company that was established in 2002. The founder were one of the pioneers of fresh fish export, has established the first fish/seafood processing plant fully designed to HACCP regulation in 2010 in Oman. It is located in Al Dhakliesh region, about 30 km from Rusayl Industrial Area in Muscat.</td>
<td><a href="http://www.bluewaters.om">www.bluewaters.om</a></td>
</tr>
<tr>
<td>Blue Waters Company</td>
<td>Fin-fish farming company established as subsidiary under OADC in 2016. Developing finfish aquaculture projects, processing facilities, product development, branding and establishing marketing network to outreach the customers domestic, regional and international. Currently cultures premium quality of gilt-head seabream with a plan to expand to other species like Seabass, Barramundi &amp; other species.</td>
<td><a href="http://www.bluewaters.om">www.bluewaters.om</a></td>
</tr>
<tr>
<td><strong>Oceanic Shrimp Aquaculture</strong></td>
<td>Subsidiary of OADC. Developing shrimp aquaculture projects, processing facilities, product development, branding and establishing marketing network to outreach the customers domestic, regional and international. OSA intend to collaborate with technical partners globally to bring in the state of the art technology to ensure bio-secure and sustainable development.</td>
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<tr>
<td><strong>Oman Fisheries Co.</strong></td>
<td>Largest and oldest fish processing company in Oman.</td>
<td></td>
</tr>
<tr>
<td><strong>Oman Aquaculture Company</strong></td>
<td>Joint venture between South African abalone farming company Abagold Muscat Overseas Group (MOG) to harvest up to 600 tonnes of abalone in the sultanate.</td>
<td></td>
</tr>
</tbody>
</table>
International collaboration

The UK Center for Environment Fisheries & Aquaculture Science (Cefas) is working with the Ministry of Agriculture and Fisheries to draft the revised legislation for aquaculture health management; introduced national fisheries management and aquaculture health management development plans into the national economic diversification strategy; provided training to Ministry staff in aquaculture disease diagnosis and fisheries assessment techniques in our laboratories in the UK; initiated a baseline study of the presence of aquatic diseases in the natural environment to inform implementation of aquaculture regulation.

In November 27 2018, a Danish business delegation visited Oman. They had meetings with OADC, visited their fish farm and had business dinner in the evening.
OPPORTUNITIES, CHALLENGES & RECOMMENDATIONS

General opportunities.

The government of Oman has a clear vision - the Fisheries and Aquaculture 2040 Vision – to evolve their fisheries and aquaculture industries from a subsidies sector into one of the pillar industry sectors contributing to net wealth creation in Oman. The targets are to increase production to more than 220,000 tones/year; add 11,000 jobs and contribute up towards 1 billion USD to the Omani economy.

As discussed, the natural competitive advantages that may enable Oman to evolve into international significant aquaculture nation include:

1. Long history of fisheries and ocean resource harvesting, and a long and rich coastline. Many ports and well developed land-transport infrastructure.
2. A government with clear vision, strategies and plans to develop the industry.
3. Shallow continental shelf (10-20km in places) offering easy access to cold water for land-based aquaculture.
4. Large pool of both experienced fishermen and a young and eager population.
5. Proximity to huge and fast-growing markets for seafood (Middle East, India, East-Africa). Well developed air and ocean transport infrastructure.

Given the current state of the industry and supporting educational and research institutions, the Omani government is welcoming cooperation with countries with more mature aquaculture industries, including Norway.

The MFA identifies the following areas of development and international cooperation:

1. Building Scale Operations: Concentrate on culturing species that provide economies of scale.
3. Ensure competitive cost of production By integrating across the value chain to reduce cost including feed, hatchery, brood stock.
5. Multiple product forms for multiple markets: Build processing plants to produce raw, semi processed, processed, frozen block.
Opportunities for Norwegian stakeholders

Norway’s 30+ years’ experience of aquaculture, bringing it to be the leading Atlantic salmon producer and exporter in the world, suggests that there are cooperation opportunities across the entire value chain of a sustainable and effective aquaculture industry. There are many similarities between the two countries that supports cooperation on government, institution and company levels:

- similar geographical size and population
- both have long and strong ocean legacies: fisheries, ocean-based trade, maritime industry
- both economies heavily depends on petroleum resources; and with governments eager to diversify the economy into new sectors. Norway has succeeded in making aquaculture it’s third largest export industry (after petroleum and maritime); while Oman has similar visions.

We propose that Norwegian and Omani stakeholders consider collaboration and joint business opportunities across the following areas:

1. Education and research

Omani education and research on aquaculture and fisheries are mainly offered through the following institutions.

Sultan Qaboos University, Department of Marine Sciences and Fisheries. ([www.squ.edu.om/agr/Departments/Marine-Science-and-Fisheries](www.squ.edu.om/agr/Departments/Marine-Science-and-Fisheries))

The department offer B.Sc, Master and PhD in Marine Science and Fisheries; Minors in Agricultural Economics, Food Science and Animal Science and Health. Courses include: Seafood Quality, Advanced Aquaculture, Integrated Coastal Zone Management, Marine pollution and Conservation, Marine Natural Products, Marine Tourism, Marine Biochemistry and Molecular Biology, Marine Microbiology, Marine Vertebrate Zoology and Marine Invertebrate Zoology.

The Department of Marine Science and Fisheries focuses its research on several main areas, i.e. Marine sciences and Oceanography, Fisheries, Aquaculture and Marine Biotechnology.

The department has cooperation with institutions in UK, Denmark and Germany.

Vocational College for Marine Sciences (Ministry of Manpower) gives vocational diploma in aquaculture.

Norwegian institutions:

Norwegian schools and institutions are in the world lead with respect to vocational training, higher education and research on aquaculture. The following universities offers higher education (master, PhD) programs across the aquaculture value chain:

- Norwegian University of Life Sciences ([www.nmbu.no](www.nmbu.no)): Aquaculture; Aquatic Food Production; Animal and Aquaculture Sciences (PhD);
- University of Bergen ([www.uib.no](www.uib.no)): Fisheries Biology and Management; Aquaculture Biology; Marine Biology;
- Norway University of Science and Technology ([www.ntnu.edu](www.ntnu.edu)): Marine Technology/Marine Resources; Ocean Resources/Ecosystem/Aquaculture; Aquatic Food Science;
- Nord University ([www.nord.no](www.nord.no)): Aquatic Biosciences (PhD); Biosciences; Aquaculture and Marine Biosciences.
- Arctic University of Norway ([www.uit.no](www.uit.no)): International Fisheries Management;
Some of these universities offer special courses that can be tailored to specific needs of e.g. Oman vocational and higher education institutions.

Several Norwegian research institutions are engaged in aquaculture sector, where the leading includes:

- Nofima ([www.nofima.no](http://www.nofima.no)): research and development for the fisheries, aquaculture and food industries. Focal areas include: Breeding and genetics; fish health; food safety and quality; biotechnology; nutrition and feed technology; seafood industry/industrial economics. HQ Bergen, Norway, ~400 employees

- SINTEF Ocean ([www.sintef.no](http://www.sintef.no)): The largest research institute in Norway. In this context - focus on aquaculture technology; marine pollution; fisheries technology and bio marine processing. HQ Trondheim, Norway ~340 employees (SINTEF total ~2,000).

- Institute of Marine Research ([www.imr](http://www.imr)): the largest centre of marine research in Norway. In January 2018, the IMR was merged with NIFES – the National Institute of Nutrition and Seafood Research. The new institute will be a leading supplier of knowledge relating to the sustainable management of the resources in our marine ecosystems and the whole food chain from the sea to the table. 750 employees.

**Opportunities and actions:**

We assume there could be interest in establishing academic collaboration between e.g. Sultan Qaboos University and one of or more leading Norwegian universities; student and alumni exchange; joint education programs; research collaboration.

**Actions:**
- Identify existing relations between Omani and Norwegian academic and research institutions, if any.
- Verify general interest in establishing academic and research cooperation. Venue for initial discussion could be the Oman-Norway workshop in Muscat around April 25th.
- Identify specific areas of cooperation and topics for research cooperation – preferably through workshops and management meetings. A good venue could be the AquaNor expo in Trondheim in August 20-23 2019.

**2: Knowledge transfer and consultancy**

We assume there would be potential for knowledge transfer and advice from Norwegian companies and institutions on a number of areas, including:

- Given that the site (area) selection process for aquaculture in Oman has been done (ref. the "Atlas"), Norwegian expertise in specific bottom conditions and environmental assessment may be valuable. This include use of AUVs and underwater drones; camera and sensor technologies and modeling and simulations.
- Technology selection for both land-based/RAS and offshore cage systems.
- Seafood processing, packaging and transportation topics.
- Resource planning and management; concessions; regulations; standards and best practices from regulatory and governing agencies.

**Actions:**
- We propose a Oman-Norway workshop around April 25th where specific problem statements (needs) are identified and discussed, leading to specific collaboration initiatives.
According to MFA, the high-level problem statements are within:

- **Building Scale Operations:** Concentrate on culturing species that provide economies of scale.
- **Training & education:** Enable training & development of the Omani workforce for the future of aquaculture.
- **Ensure competitive cost of production by integrating across the value chain to reduce cost including feed, hatchery, brood stock.**
- **Superior quality produce:** Adopting best in class bio security practices, production protocols & controlling feed quality.
- **Multiple product forms for multiple markets:** Build processing plants to produce raw, semi processed, processed, frozen block.
- **Multiple Market Focus:** Ensure presence across multiple markets.

### 3: Business opportunities

The Omani aquaculture is still rather immature mainly dominated by governmental initiatives and players and with few pure commercial stakeholders. However, the government is promoting private engagement in the industry and thus the timing for early commercial movers may be right.

Opportunities may range from providing technology to taking commercial stakes in the seafood production facilities.

**Actions:**

We propose to use the Oman-Norway workshop in April as a early arena for identifying the commercial opportunities and also specific considerations of doing business in Oman (for example in-country-value requirements etc.). Then follow up with a delegation from Oman to Norway in connection with the AquaNor expo in August to have business-to-business meetings.

**List of Norwegian stakeholders with expressed interest in Oman aquaculture industry:**
REFERENCES AND ATTACHEMENTS


FAO 2017: Food and Agriculture Organization of the United Nations: National Aquaculture Overview – Oman:  

2015 - Investment Guidelines for Aqua Culture Development In The Sultanate Of Oman

2010 - Atlas of Suitable Sites for Aquaculture Projects in Oman