

The background of the slide is a photograph of a salmon farming operation in a fjord. Several large, circular net pens are visible in the water, with yellow buoys marking their locations. In the distance, snow-capped mountains rise above the water under a blue sky with some clouds. The image is partially covered by a dark teal overlay on the left and several large, light blue triangular shapes that create a geometric pattern across the right side.

CIVITTA

\ Salmon case study

Data provided in this case study is fictional and is presented for illustrative purposes only. All answers should be solely based on the information provided in the case study.

2021

\ CONVENTIONAL SALMON FARMING IS UNSUSTAINABLE IN SHORT- AND LONG-TERM

THE SALMON PROBLEM

- **Importance of salmon** | Wild pacific salmon is a hugely important species in the north pacific rainforest ecosystem. They provide nutrition for many animal species, a conduit for marine nutrients to help forests thrive, and food and cultural meaning for local populations
- **Decline of salmon** | Wild populations of salmon have been on the decline for several decades now, some species being on the brink of extinction. Thus, fishing quotas were introduced and new ways of fishing salmon had to be established
- **Salmon farming** | Currently, the most popular way of catching salmon involves farming in two stages. First, fresh water hatcheries are set along the oceanic coastal line. Second, the production uses ocean pens that hold hundreds of thousands of salmon and use ocean currents for the supply of oxygen and chemical pollutants, faeces, uneaten feed removal from the pens
- **Market** | Annual growth of seafood production has been steadily decreasing, as the biological boundaries of fishing and traditional fish farming are being reached. It is estimated that by 2030 demand will grow by 20%, while the supply will grow by 17.6%, with the difference growing further over the years. Importantly, salmon is a top 2 aquatic product by value



PROBLEMS ASSOCIATED WITH SALMON FARMING IN PENS

- Oceans are directly contaminated with wastage – every tonne of salmon creates about 42-66 kg of nitrogen waste and 7.2-10.5 kg of phosphorus waste. This leads to algae bloom
- High concentration of salmon in pens is subject to high rates of diseases, parasites, and deaths
- Salmon pens are often leaky or can fail, leading to fish escaping, spreading the diseases and breeding, which reduces the fitness of wild salmon
- Salmon farms and pens need to be located in specific locations, often far away from consumers. This involves long-distance transportation, which creates pollution in the environment
- Traditional salmon farm capabilities are subject to the environment and temperature, about 15% of salmon die due to various cause (i.e., sea lice, cramped pens or various diseases)

\ RECIRCULATING AQUACULTURE SYSTEMS (RAS) FACILITY HAS BEEN CREATED TO TACKLE THE PROBLEMS IN TRADITIONAL SALMON FISHERIES

KEY DETAILS AND BENEFITS OF RAS

Recirculating Aquaculture Systems (RAS) is a land-based salmon raising facility, that raises the fish in a controlled environment using water recirculation technology

- 1 It can be located anywhere, placed near the market - reducing transportation costs and pollution significantly
- 2 The system enables 99% recirculation of water and at the same time filters out all the pesticides and toxins – reducing water wastage and pollution to 0
- 3 Salmon are raised in a controlled, monitored environment – the risk of diseases is greatly reduced and no danger of escapees
- 4 Controlled environment results in salmon growing faster, healthier and at the same time free from antibiotics, microplastics – healthier product to the consumer



RAS enables environment friendlier fish farming and at the same offers a solution to the salmon supply problem, helps preserve wild salmon population

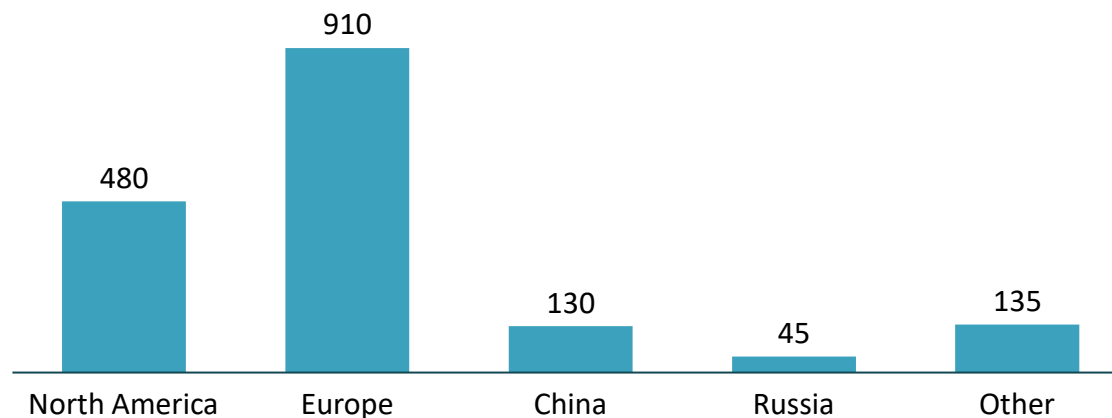


\ RAS COULD HELP TACKLE SEVERAL OF THE SUSTAINABLE DEVELOPMENT GOALS, ESPECIALLY COMBINED WITH RENEWABLE ENERGY, BUT EXPANSION HAS BEEN SLOW

SITUATION WORLDWIDE WITH THE RAS SOLUTION

- In 2019, only 5,000-10,000 tonnes of Atlantic salmon was produced in RAS globally
- In the long term, planned future production capacity exceeds 1.7 million tonnes
- The US, for example, consumes 500,000 tonnes of WFE of salmon every year, with a 90% seafood trade deficit
- Nordics Aquafarms' facility in Maine is in the advanced planning stage, with 2 phases, each having 12,500 capacity and at a cost of €435m
- Overall, Nordics Aquafarms' current facilities harvest high-quality salmon, which is sold at a premium

PLANNED SALMON PRODUCTION CAPACITY IN RAS, 1,000 TONNES



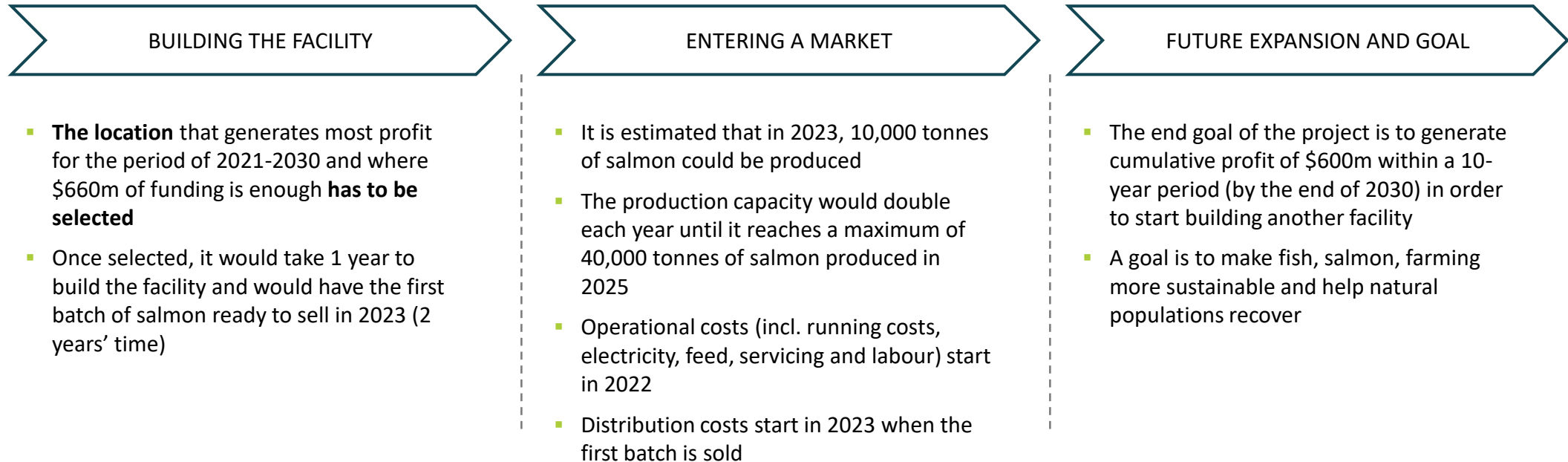
OPERATING COSTS AND RAS BENEFITS

- Typically, raising salmon costs 3.91 EUR/kg, feed accounting for 50% of the costs, operating costs (labour included) being at 38% and smolt 12%
- The planned RAS facility in Maine has similar EUR/kg costs; in some areas, there are big savings, but operating costs (excluding labour) are 50% higher
- Prices are based on the fish size; the price ranges from 3.9-9.33 EUR/kg
- The 80% of salmon global supply is produced in 2 countries, while only 4% of produced are consumed domestically, thus, a big portion of the costs come from transportation, more than 0.85 EUR/kg
- According to Grieg Seafood, investment costs per kg harvested for new sea cage production in Norway (top 1 producer of salmon) could be 40% higher than RAS expansion if we include licenses

\ 'OCEANS FOR THE FUTURE' IS PLANNING TO LAUNCH A NEW RAS FACILITY IN A COUNTRY CALLED METROLAND

KEY DETAILS, REQUIREMENTS AND THE TIMELINE OF THE PROJECT

- **Context** | A philanthropic investor has given \$660m for the non-profit, ocean preservation organization called “Oceans for the future” to build a land-based facility that would sustain itself and generate enough profit to build another facility. The organization has partnered with a company that has created RAS and has hired a consulting agency to oversee the project
- **Location** | “Oceans for the future” has identified 3 potential districts for the facility in a country called Metroland, whose local fishing community was devastated by a ban on salmon fishing. Thus, they want to build a facility there in order to help out the local communities and rebuild the world’s famous salmon fishing culture



STAKEHOLDERS REQUIRE THE PROJECT TO BE POSITIVELY EVALUATED BY THE ENVIRONMENTAL, SOCIAL AND CORPORATE GOVERNANCE (ESG) CRITERIA

ESG FRAMEWORK AND SUSTAINABLE DEVELOPMENT GOALS

Context | Environmental, Social and Corporate Governance (ESG) typically evaluates a collective firm’s impact on social and environmental factors. It gives a more holistic view of the company’s operations, its investments in sustainability. These metrics ensure that the company or a project is being judged not only by the financial performance.

Metrics | As it can be seen from the name, ESG metrics can be sorted into three groups:

- Environmental: usage of renewable energy, energy efficiency, greenhouse emissions, water management, waste recycling and free of pollution.
- Social: impact on local communities, health and safety, diversity and working conditions
- Governance: ethical standards, board diversity, stakeholder engagement.

Requirements | “Oceans for the future” organization and the philanthropic investor view ESG one of the most important reasons why the RAS facility is being built. They expect the facility to satisfy several of the 17 Sustainable Development Goals, which can be seen below:



EXPECTED BRIEF ESG REPORT

Name of the impact	Evidence
XXX	...
XXX	...
XXX	...

\ YOUR TASKS:

Questions

- A. What percentage of total planned RAS production globally would our RAS facility satisfy under maximum production? (indicate the figure in %, round to 1%)
- B. Identify the best district for RAS facility construction (base your decision on 10-year cumulative net profit^{1,2}, feasibility limitations and do not round while calculating):
 - 1. What is the best location for RAS facility construction? (indicate district name)
 - 2. What electricity solution should we use in this setup? Why? (explain the choice in 1-2 sentences)
 - 3. What feed solution should we use in this setup? Why? (explain the choice in 1-2 sentences)
 - 4. What is the 10-year cumulative net profit generated in this setup? (indicate the figure, round to millions)
 - 5. What, if any, options do not generate the required amount of funds during 2021-2030 period? (district names)
 - 6. Is there a better option, if there was more funding available and how much funds we lack? (indicate district name and indicate figure how much more funding we would need, round to millions, if such option exists)
 - 7. What year does the RAS facility start generating profit? (indicate year)
 - 8. How much salmon is exported yearly from 2027-2030? (indicate the figure in kg, round to millions)
 - 9. Does a RAS facility in Truland provides a cost efficiency compared to typical salmon farming once full capacity is reached? (explain and prove in 2-3 sentences)
 - 10. What would be the net profit margin in the year 2030 if we invested in Laeburg? (indicate the figure in %, round to 1%)
- C. ESG impact report
 - 1. List at least 5 of the ESG framework impacts that the RAS facility would have and provide brief supporting evidence based on the information in the case study only (Tip: use the expected brief ESG report form)

Notes:

1 – Net profit is calculated as revenues minus costs; also, consider CAPEX as costs for the net profit calculation

2 – Disregard time value of money and any tax considerations in your calculations

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\ Additional data

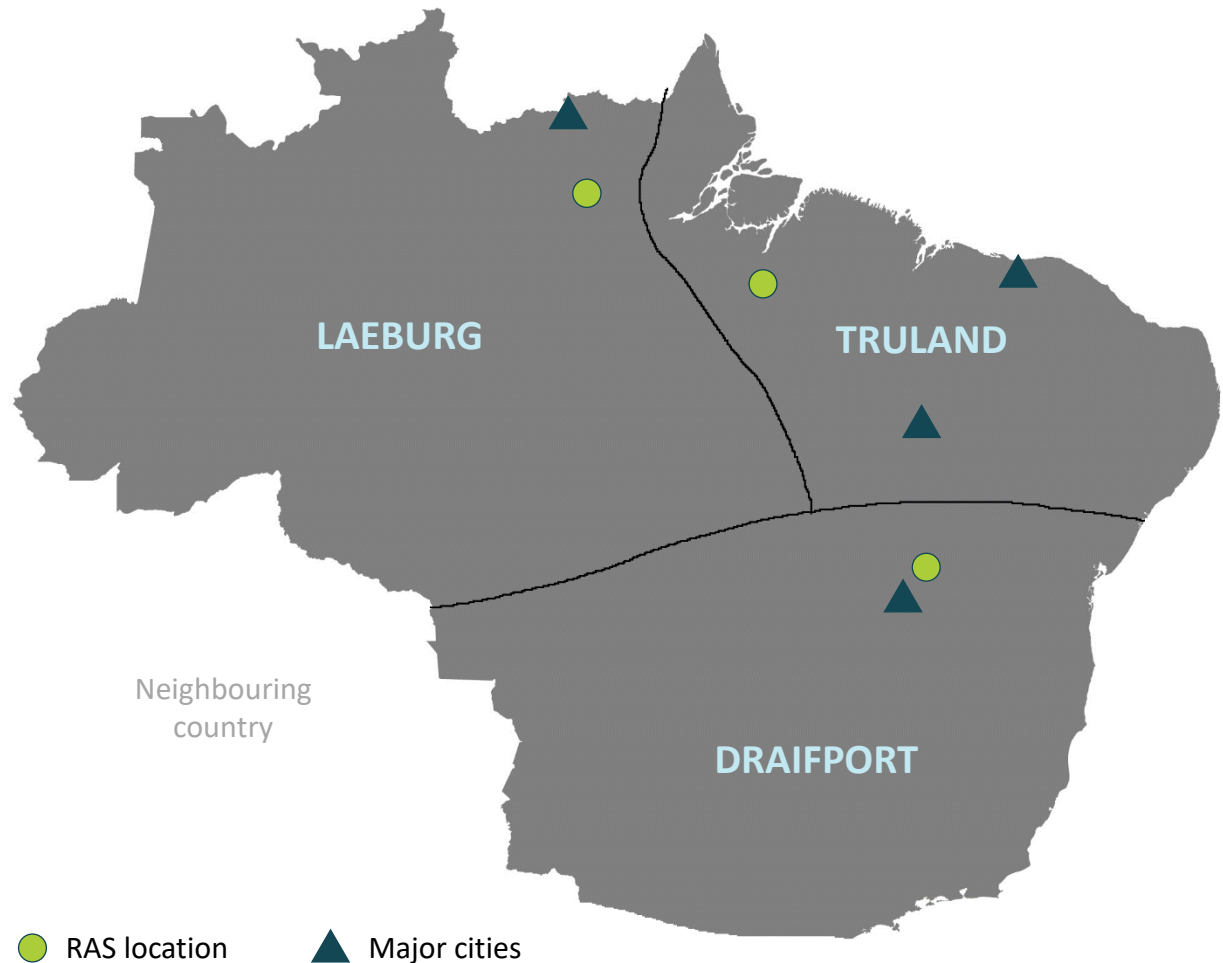


\ DETAILS ABOUT OPERATING IN METROLAND

IMPORTANT INFORMATION FOR OPERATIONS

- RAS facility requires both freshwater and saltwater for salmon growth and locations in each district ensure that supply of water
- Water supply cost is part of operation expenditure already estimated by previous analysts
- Government officials have already signed a preliminary contract allowing for the RAS facility to be built and do business in Metroland for at least 20 years
- Local populations in each of the districts are positive about the RAS facility being built, especially since it will provide workplaces for the people who were affected by the salmon fishing ban
- There is an abundance of both basic labor and specialized labor for salmon farming in RAS

DISTRICTS OF METROLAND AND KEY LOCATIONS



\ DRAIFPORT – AN INDUSTRIOUS, SECOND BIGGEST BY POPULATION DISTRICT IN METROLAND

KEY DETAILS ABOUT DRAIFPORT



DRAIFPORT

POPULATION ¹	3,500,000
URBANIZATION, %	44
AVERAGE MONTHLY SALARY ² , \$	2,200
MONTHLY AVERAGE RENT OF LAND, \$/ha	14,500
SUNNY DAYS ³ , %	85

- District municipality has recently demolished an abandoned factory and has a perfectly located plot of land of 42 ha at a monthly rent of 15,000 \$/ha
- This would enable the delivery costs to the supermarkets in the cities at a cost of 0.1 \$/kg
- Accessing people in the countryside would be through 3 different marketplaces that split equally countryside population and would require 10 additional employees and \$200,000 annually each
- Draifport has an advanced railroad network that would enable the export of salmon at a cost of 0.2 \$/kg to other countries
- A recent district-wide survey has shown that the population is split, 44% preferring the life in the city, while the other part prefer more relaxing countryside – this tendency has been there the past 25 years
- Establishing a warehouse in Laeburg would cost \$300,000 yearly and the delivery would cost 0.12 \$/kg. Then, local Laeburg city/countryside charges apply
- Establishing a warehouse in Truland would cost \$800,000 yearly and the delivery would cost 0.08 \$/kg. Then, local Truland city/countryside charges apply

*Note: 1 – the population is expected to be at the same level for the next 25 years; 2- salary does not increase;
3- Sunny days are without thick clouds for solar panels to generate power*

\ LAEBURG – A MORE RURAL, SMALLEST DISTRICT BY POPULATION IN METROLAND

KEY DETAILS ABOUT LAEBURG



LAEBURG

POPULATION ¹	3,000,000
URBANIZATION, %	32
AVERAGE MONTHLY SALARY ² , \$	2,100
MONTHLY AVERAGE RENT OF LAND, \$/ha	14,000
SUNNY DAYS ³ , %	75

- Laeburg has an international port in its major city that would enable export relatively cheap, it currently charges an average price of 0.1 \$/kg for delivery to foreign countries
- It has multiple 40 ha plots of land available quite near the port city, but the required infrastructure for utilities would have to be installed at a fixed cost of \$4,000,000
- If the closest plot of land is selected, the delivery costs to the supermarkets in the city would be 0.15 \$/kg
- Accessing people in the countryside is quite difficult, but there is a successful grocery delivery service in the district that charges 10% of the price paid by the customer and everyone in the countryside is using this service
- People are conservative in Laeburg, those who live in the countryside do not express interest in moving to the city
- Establishing a warehouse in Draifport would cost \$400,000 yearly and the delivery would cost 0.12 \$/kg. Then, local Draifport city/countryside charges apply
- Establishing a warehouse in Truland would cost \$800,000 yearly and the delivery would cost 0.1 \$/kg. Then, local Truland city/countryside charges apply

*Note: 1 – the population is expected to be at the same level for the next 25 years; 2- salary does not increase;
3- Sunny days are without thick clouds for solar panels to generate power*

\ TRULAND – LARGEST BY POPULATION DISTRICT IN METROLAND, HAVING A CAPITAL CITY

KEY DETAILS ABOUT TRULAND



TRULAND

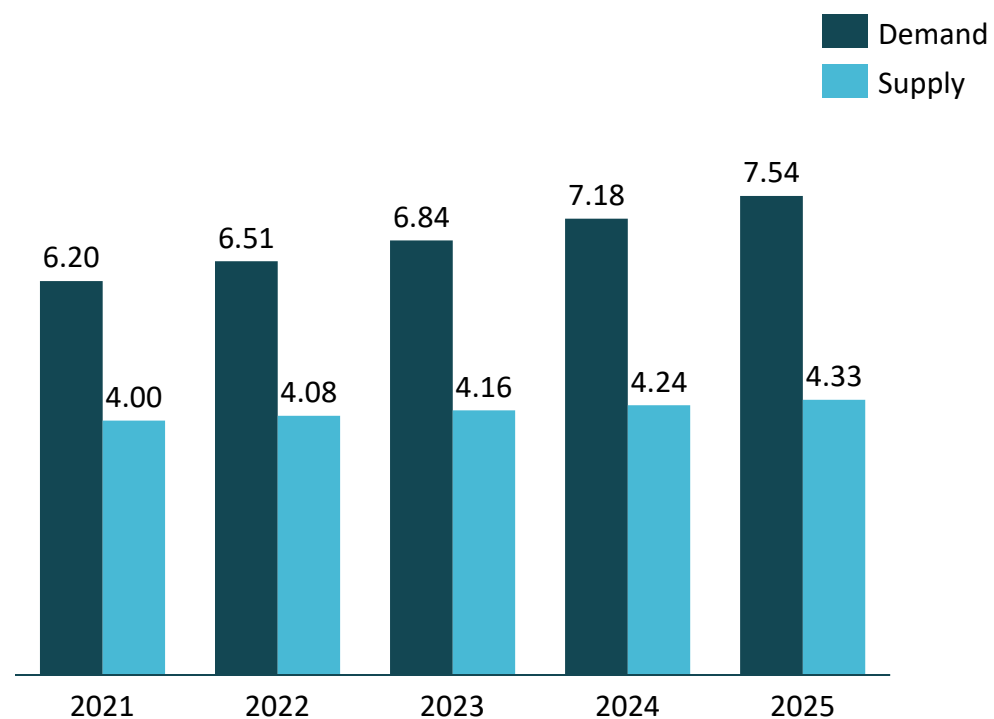
POPULATION ¹	4,500,000
URBANIZATION, %	77
AVERAGE MONTHLY SALARY ² , \$	2,400
MONTHLY AVERAGE RENT OF LAND, \$/ha	18,000
SUNNY DAYS ³ , %	80

- Truland is a small in area, but a highly urban district that has the bulk of the population concentrated in two of its cities
- There is an issue with land available and the only piece of 40 ha of land is quite far from those cities
- Is estimated that the cost of delivery to the supermarkets in the city would cost 0.25 \$/kg
- Reaching rural communities is simple, there a large marketplace nearby that would require 10 additional employees and \$250,000 annually
- Export situation is tricky in Truland, there is no capacity to use the airport to export salmon, the only way for exports is using the port of Laeburg and transporting salmon to the port would cost 0.2 \$/kg
- Analysts estimate that the level of urbanization should remain the same in Truland for at least 10 years into the future
- Establishing a warehouse in Draifport would cost \$400,000 yearly and the delivery would cost 0.08 \$/kg. Then, local Draifport city/countryside charges apply
- Establishing a warehouse in Laeburg would cost \$300,000 yearly and the delivery would cost 0.1 \$/kg. Then, local Laeburg city/countryside charges apply

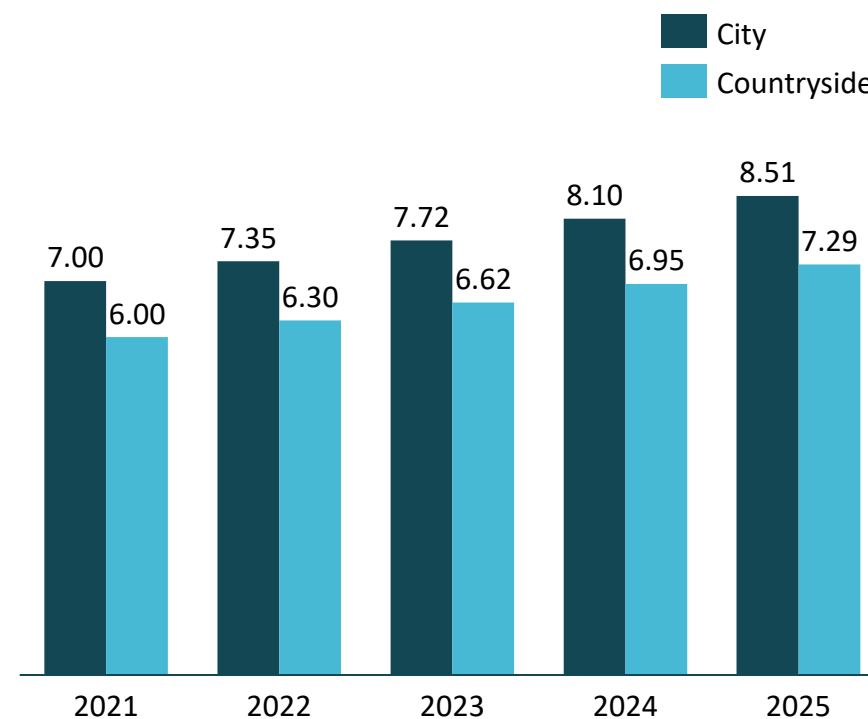
*Note: 1 – the population is expected to be at the same level for the next 25 years; 2- salary does not increase;
3- Sunny days are without thick clouds for solar panels to generate power*

\ METROLAND MARKET ANALYSIS (1/3)

SUPPLY AND DEMAND OF SALMON YEARLY PER PERSON¹, KG



PRICE OF SALMON IN CITIES VS COUNTRYSIDE², \$/KG



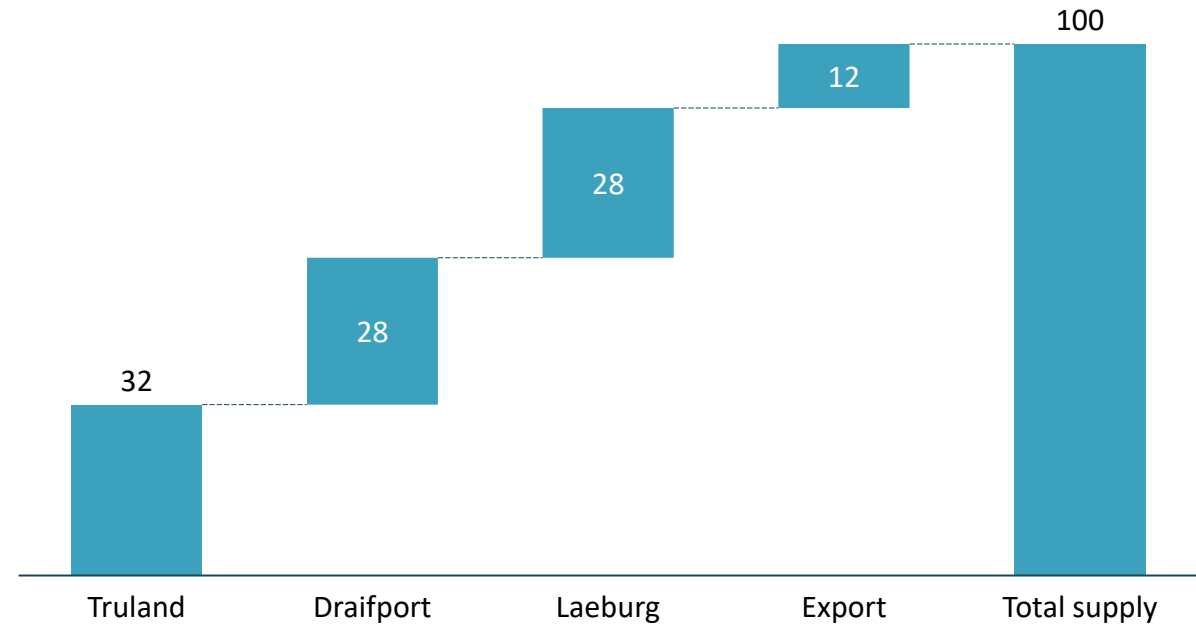
Note: 1 –both supply and demand is expected to grow at 5% after 2025, RAS facility will cover the difference and everything else is exported; 2- salmon price is going to increase at 5% annually after 2025;

\ METROLAND MARKET ANALYSIS (2/3)

REQUIREMENTS FROM THE GOVERNMENT

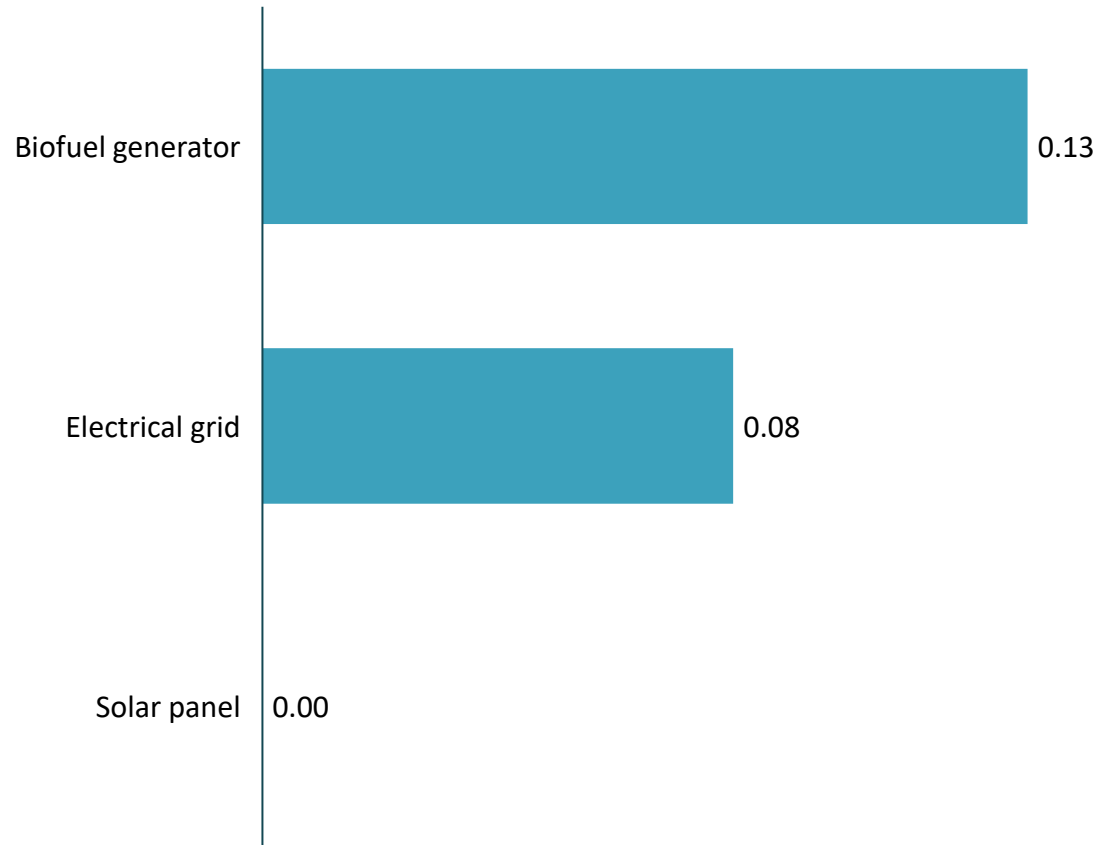
- Central government of Metroland has signed a permit approving the construction of RAS facility in any of the districts
- The government views our facility as an important project in the country, but they have one stipulation before opening the facility
- In order to preserve competitive integrity and distribute benefits of RAS facility to all districts, there was an agreement signed that fixes the amount of salmon supplied to each of the districts and export

BREAKDOWN ON RAS FACILITY SALMON LOCAL SUPPLY, % OF TOTAL RAS PRODUCTION



\ METROLAND MARKET ANALYSIS (3/3)

PRICE COMPARISON OF ELECTRICITY SOURCES, \$/kWh



\ THE COST/REVENUE LINES RAS FACILITY

BREAKDOWN OF THE COSTS AND REVENUE OF A RAS FACILITY

CAPEX	OPERATIONAL COSTS	SALES
<ul style="list-style-type: none">40 ha of land is required for the facility, and it would be leased in 10-year incrementsConstruction contractor costs, machinery and installation would total to \$500m	<ul style="list-style-type: none">Major components of operational costs are running costs, labour, logistics costs, electricity, feed supply, equipment servicing if anyRunning costs would total to \$15m a yearIt would take 200 employees to run a facility in any of the districtsA big chunk of operational costs is electricity, the facility requires 7 kWh/kg for production. There is an option to invest in solar panels that would fully serve electrical demand during the sunny days, while biofuel generators would have to serve during the cloudy days; if solar panels are not used, electrical needs could be served by the electrical grid of MetrolandA contract has been signed with a supply chain of supermarkets in Metroland, which charges 1.2 \$/kg per salmon soldSupply of feed starts in 2022 and it is being supplied continuously beyond 2030	<ul style="list-style-type: none">The RAS facility will be supplying the difference between supply and demandThe percentage supplied for each district and the percentage of export has been fixed by the government each yearA 10-year contract for export was signed at 4 \$/kgExport would be made using the option available in the district where the facility is based

\ ELECTRICITY CAN BE SUPPLIED BY USING THE ELECTRICAL GRID OF METROLAND OR USING SOLAR PANELS AND BIOFUEL GENERATORS

BREAKDOWN OF THE COSTS OF RUNNING A RAS FACILITY

ELECTRICAL GRID	SOLAR PANELS	REQUIREMENTS FOR THE FACILITY
<ul style="list-style-type: none">▪ Metroland has a hydro plan and a nuclear power plant supplying electricity▪ For such big capacity, extra infrastructure for the facility must be built at a fixed cost of \$1,200,000▪ Supply is possible only if 100% of the electricity is supplied by the grid	<ul style="list-style-type: none">▪ A supplier was found that would be willing to supply the required amount of 450-watt solar panels at a cost of \$350 per unit, with no salvage value▪ It is estimated that the solar panel could produce 1,380 kWh annually if all the days are sunny▪ During cloudy days solar panel production is equal to 0▪ All the panels must be ordered at once and their servicing will cost \$2,500,000 annually (year after installation)	<ul style="list-style-type: none">▪ It is estimated that the facility will require 7 kWh/kg for each fish sold next year with an expectation that facility will continue to work after 2030 at max capacity▪ When the solar panels cannot produce electricity, biofuel generators will be used to supply electricity and any extra electricity produced is not stored▪ For each 20,000 MWh of electricity required, \$4,000,000 has to be spent on the generators (all installed at once) and their servicing costs \$50,000 annually.▪ Installation of the solar panels can be done during construction and be ready when the facility opens▪ The contractor can install the required amount of solar panels at an additional cost of \$8,000,000

\ FEED IS A CONCERNING PROBLEM IN THE WORLD, OUR RAS FACILITY, DEPENDING ON THE LOCATION, HAS 3 OPTIONS

FEED PROBLEM FOR FARMED FISH

- Carnivorous fish like salmon feeds on other fish
- Feed manufactured for farmed fish use approximately 20% of the world's total catch of wild fish

THERE ARE 2 SERIOUS PROBLEMS WITH FEED

- Species caught as feed has declined by 10% over the last 10 years, whereas production of fed fish has grown by 20%
- Supply of unfed fish will not meet the demand of fed fish
- Typically, salmon needs 1.15 kg of feed to gain 1kg of bodyweight and that feed costs around 2 \$/kg of salmon raised
- Natural fish populations are dwindling, creating a chain of environmental issues
- Great demand of feed gives the way of using "bottom trawling" – dragging nets across the ocean floor and destroying ocean habitats
- The UN estimate that 95% of global ocean damage is due to trawling

POTENTIAL SOLUTIONS

NR. 1

- RAS facility "Feed" in a neighboring country could provide the required feed for the salmon RAS facility and take care of delivery because it requires special conditions for transportation and has permits for the airport
- The preliminary contract could be signed, ensuring the feed at a cost of 1.35 \$/kg of salmon raised next year because the quality and formula of feed requires less feed for salmon
- However, Truland is the only location that could benefit from this scheme because only an airport ensures the required quick transfer of feed and delivery to other districts would take too long

NR. 2

- Investing in the required special containers that are required for transferring the feed and using the port of Laeburg
- It is estimated that 4 such containers would suffice, they would cost \$5,000,000 each.
- "Feed" could take care of the transfer up until the Laeburg port at a cost of 1.3 \$/kg of salmon raised next year
- Delivery to the Laeburg facility would require 6 additional employees and an annual fixed cost of special warehousing \$1,900,000
- Delivery to the Draifport facility would require 10 additional employees and an annual fixed cost of special warehousing \$1,900,000

NR. 3

- Using the existent feed suppliers and buying directly full services including delivery at a cost of 2 \$/kg of salmon raised next year