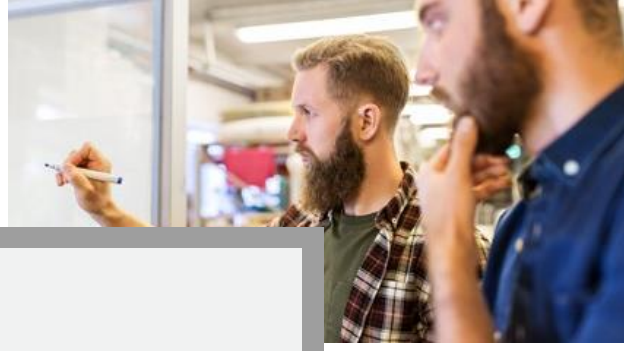
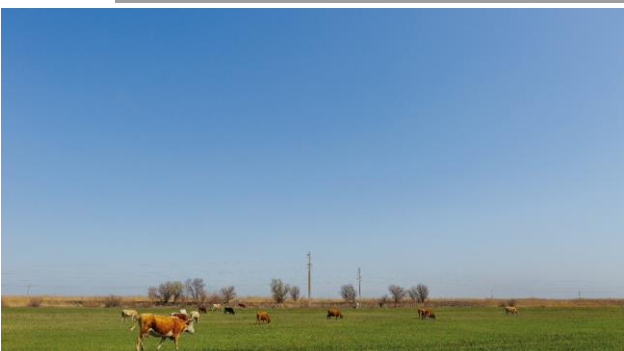
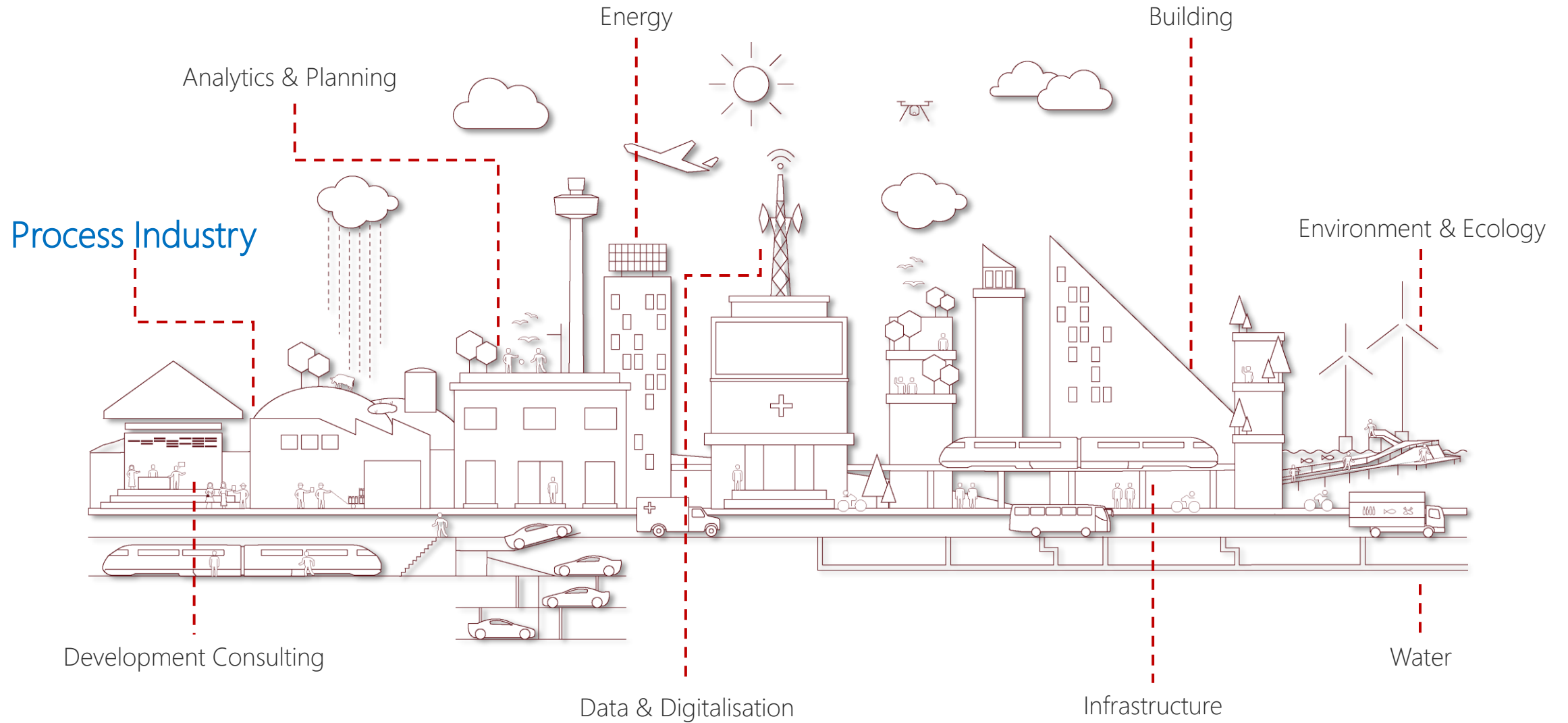




NIRAS Food & Beverage



Sectors



Global presence

36 countries

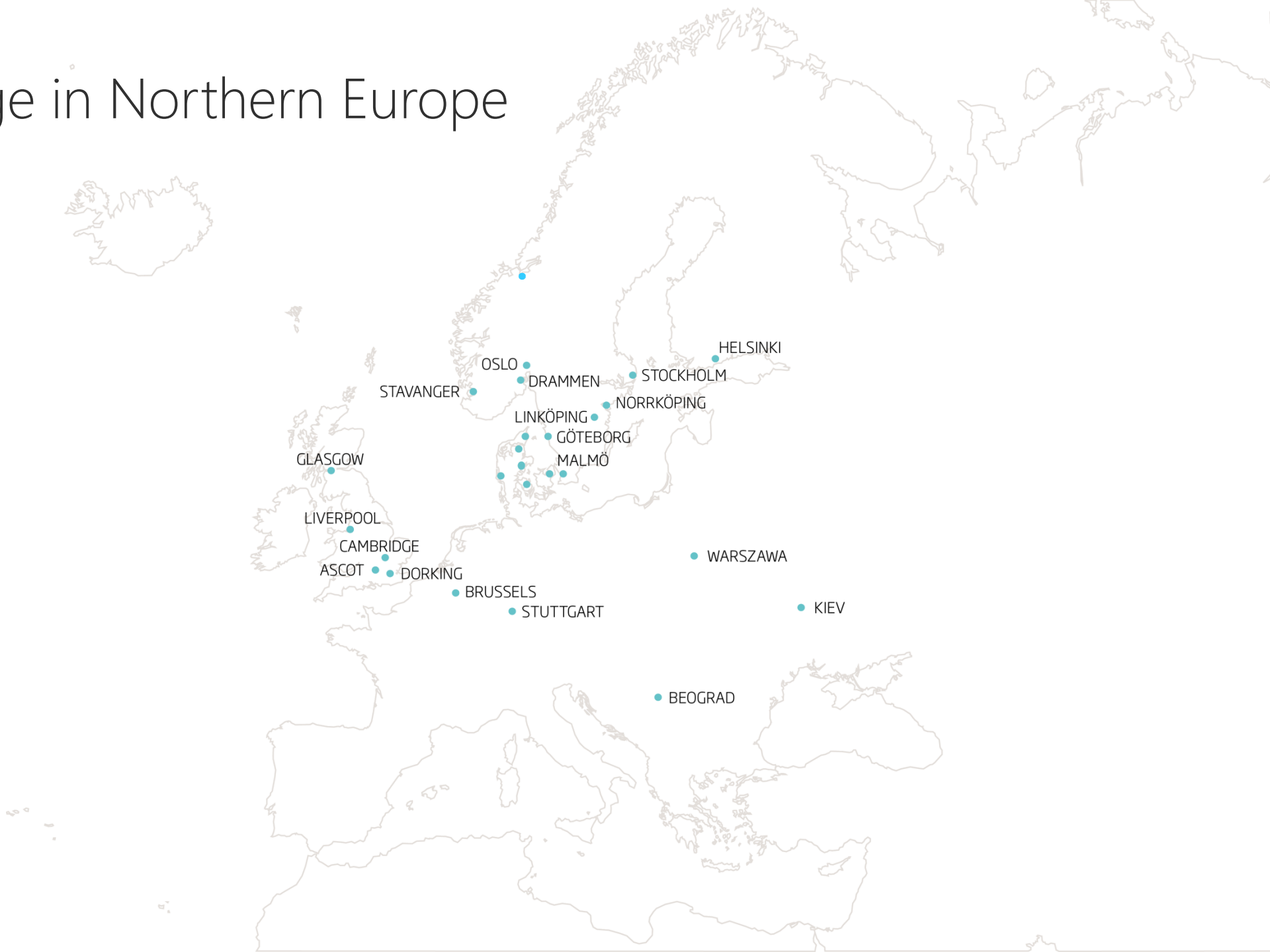
62 offices

3,200 employees

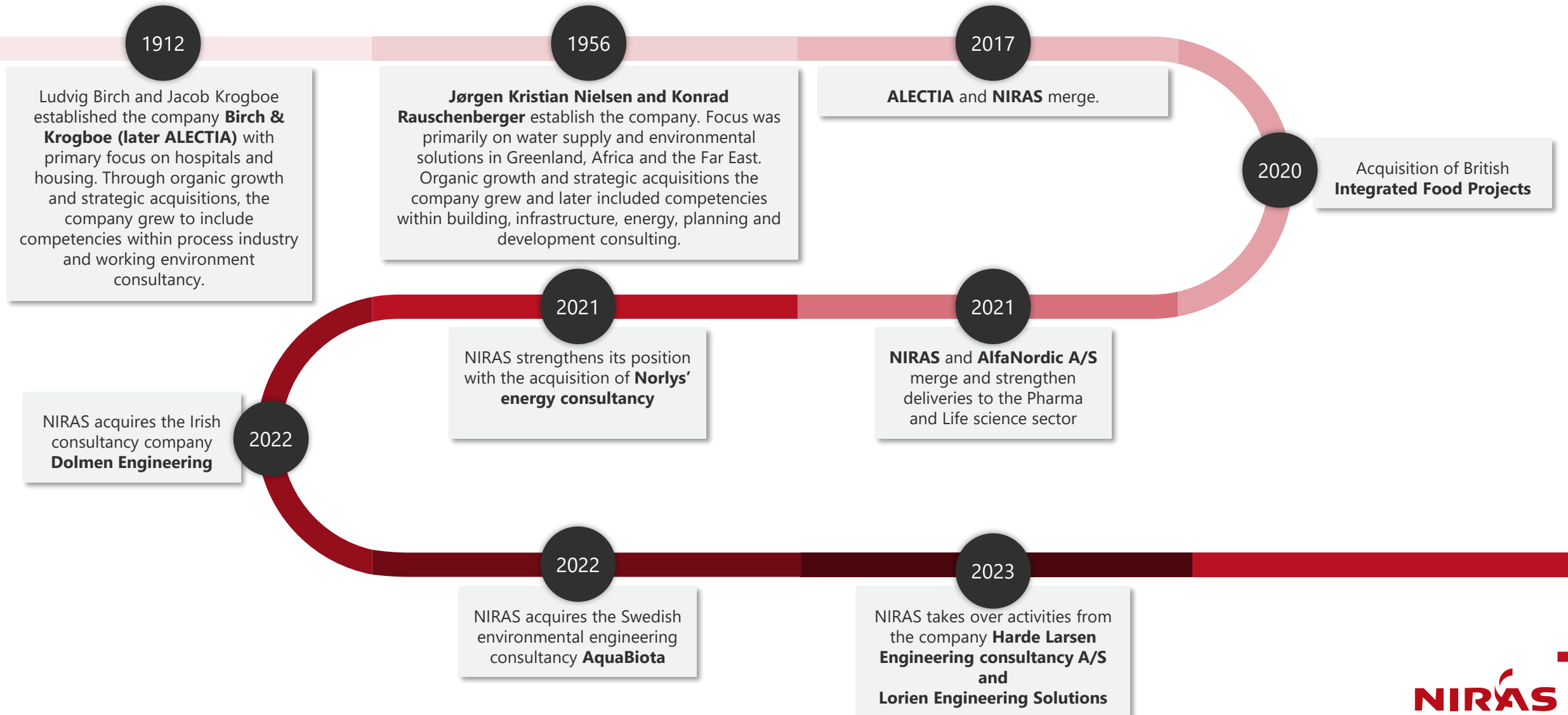
8,000 projects



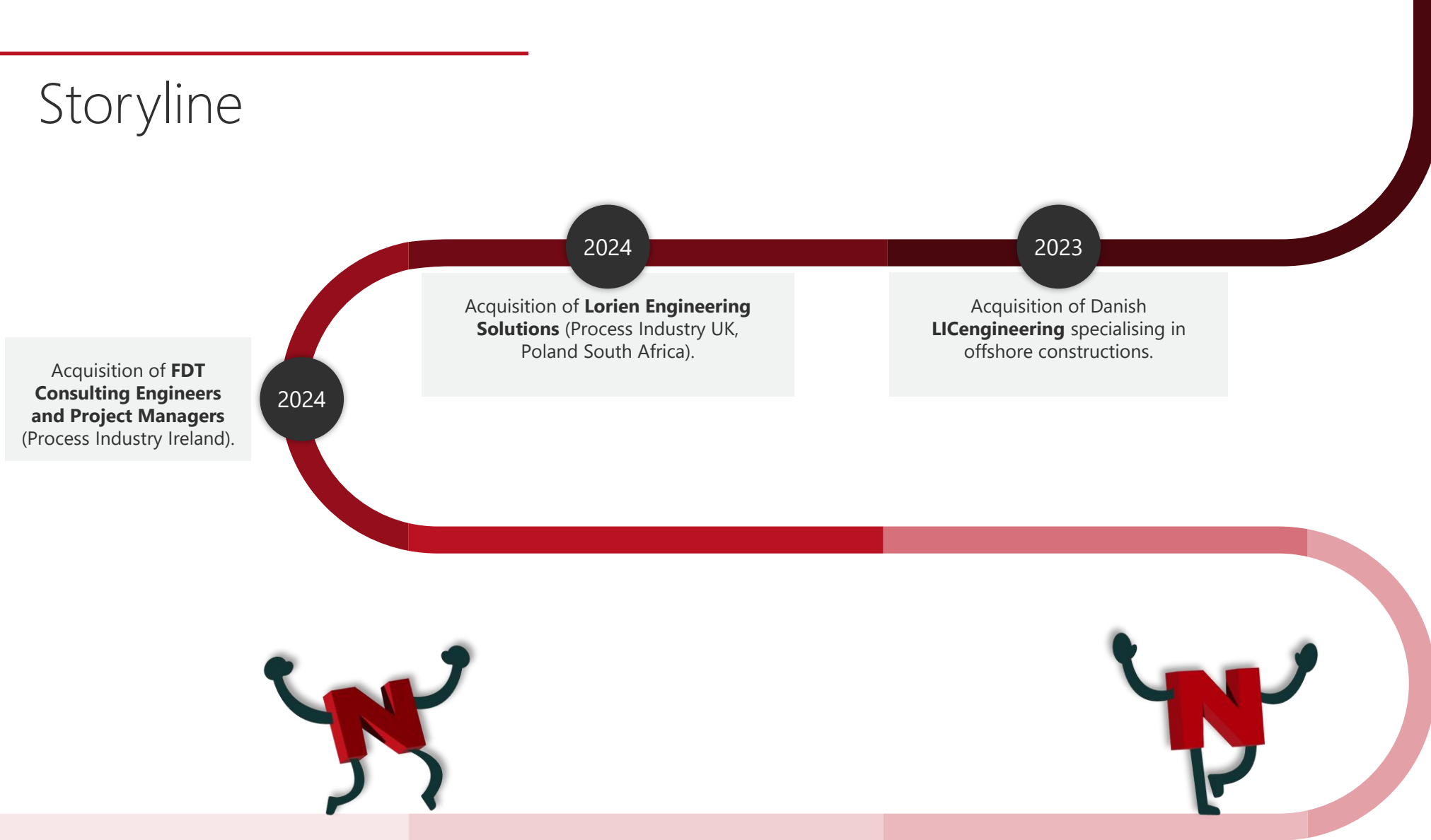
Strong Coverage in Northern Europe



Storyline



Storyline



We are foundation owned

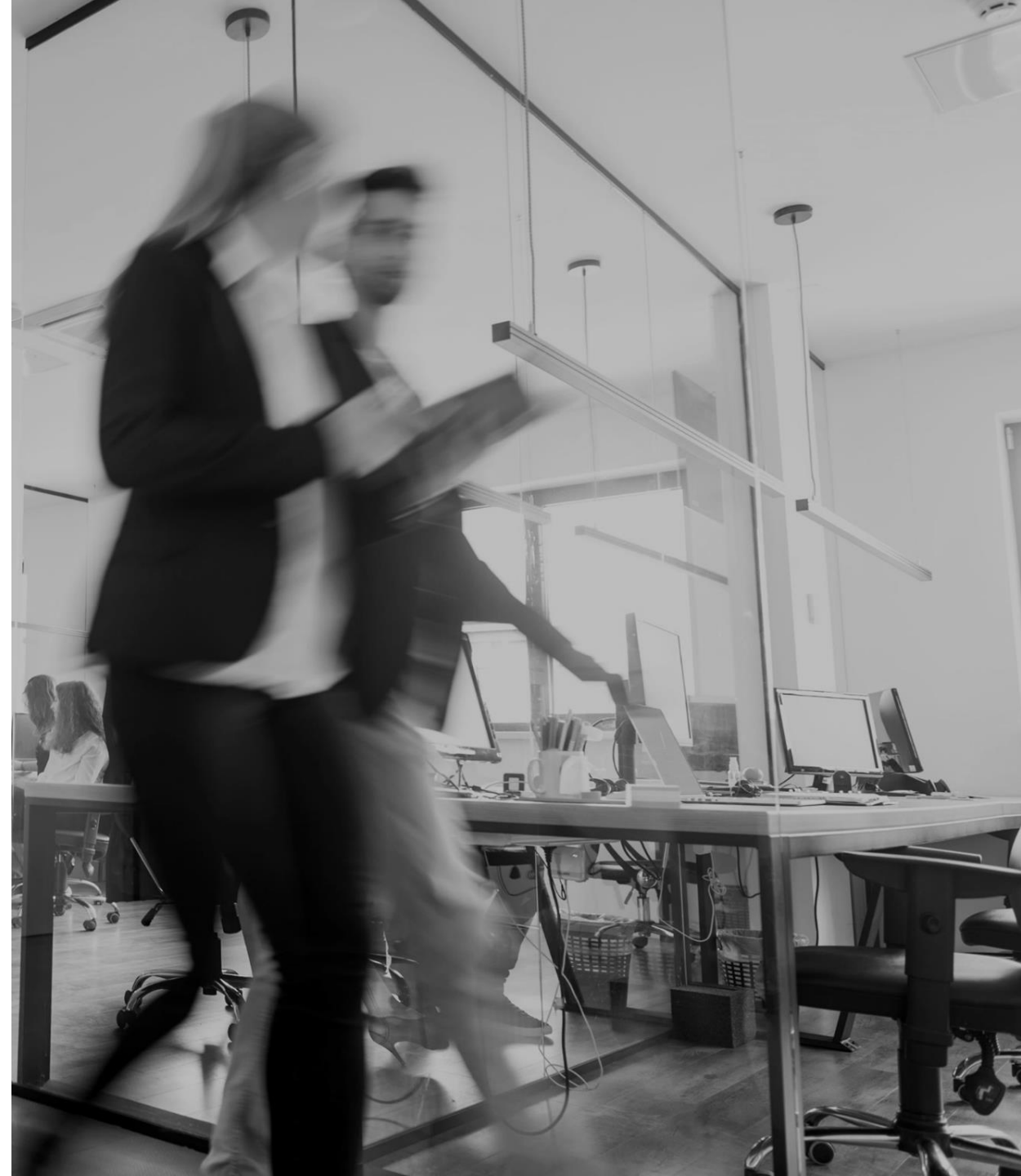
The NIRAS ALECTIA Foundation owns the majority shareholder of The NIRAS Group A/S.

According to the foundation's articles of association, the profit must be used primarily to:

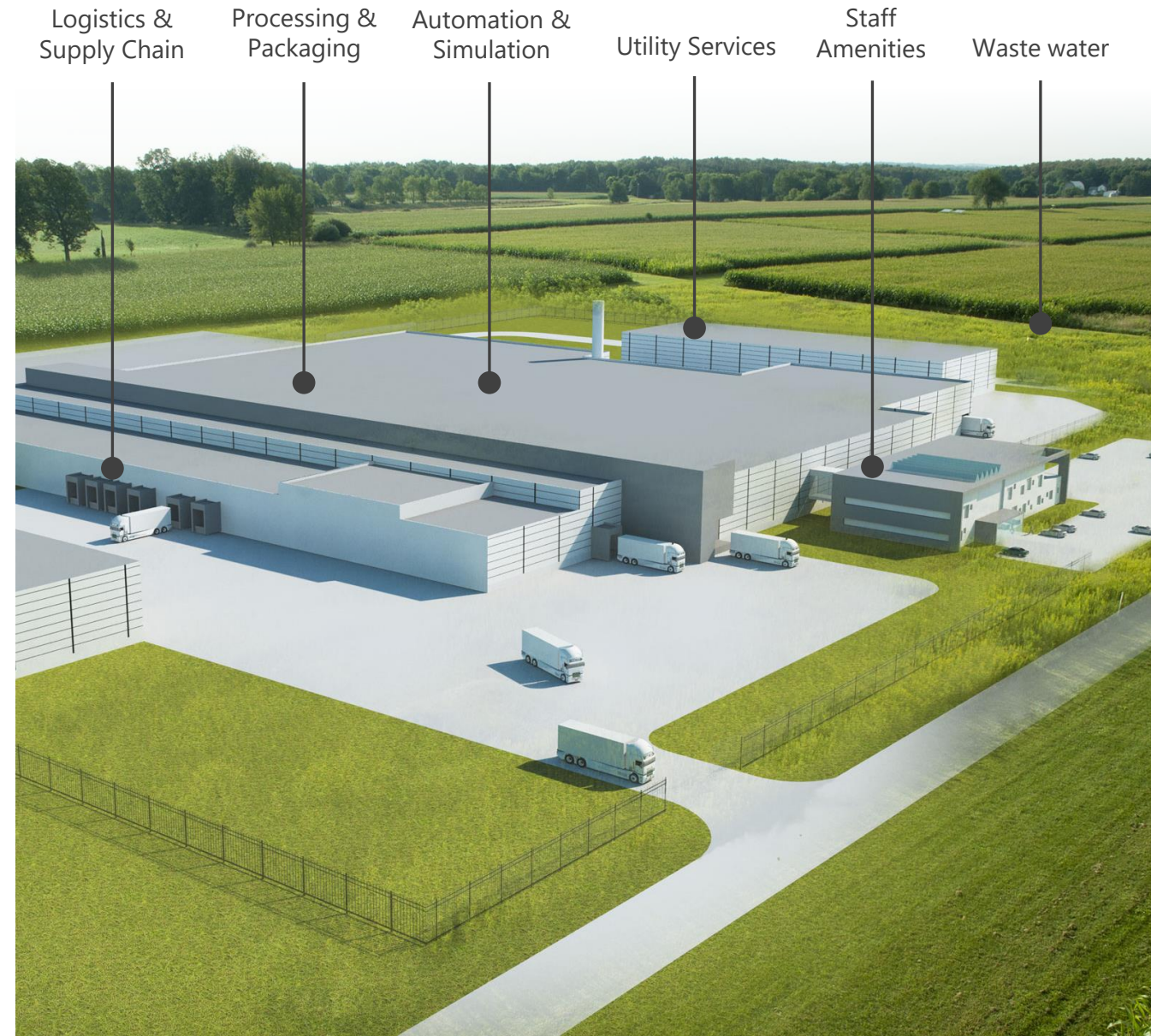
- develop NIRAS' business
- promote the education and training of engineers and technicians in industry
- strengthen the reputation of engineering companies internationally through R&D

The aim is carried out through donations in research and science, e.g. PhD programs and collaboration with universities and organisations.

In 2022 the NIRAS ALECTIA Foundation established a hub for start-up companies within the green technology – The NIRAS Green Tech Hub



We take a holistic view



NIRAS Food Competences

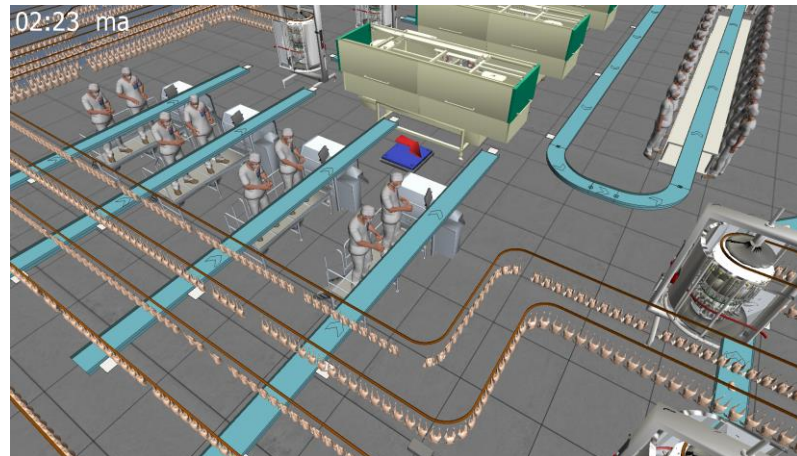
- **Food processing and design**
 - Specialist process competences within main product categories: Beer & Beverage, Meat and Dairy
 - Project Execution (Business Case, Master Plan, Conceptual design, Detail design, Tendering, production structure analyze, Supervision, Commissioning, Project Management)
- **Industrial Architecture**
 - Hygienic building design & processing facilities
- **Production simulation modelling**
- **Waste emission**
- **Energy optimization**
- **Water savings**



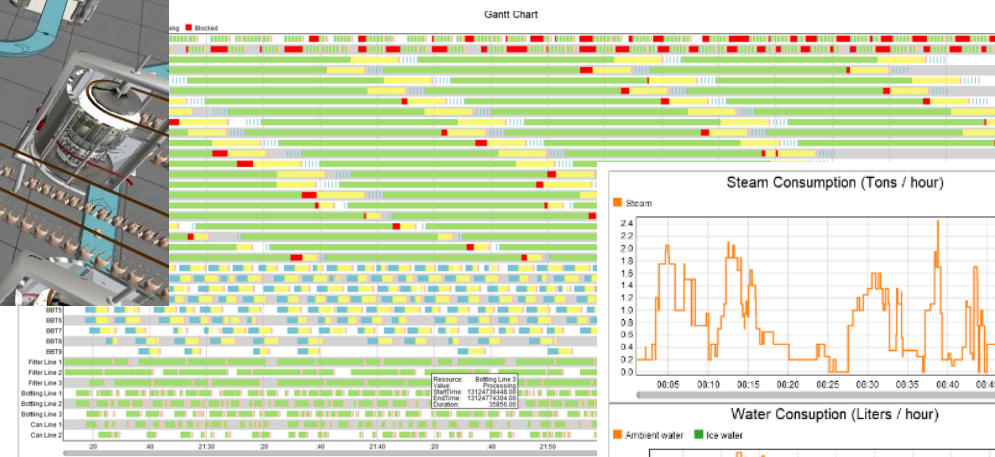
Dynamic Modelling / Simulation

Securing optimal production and consumption basis in planning and operation

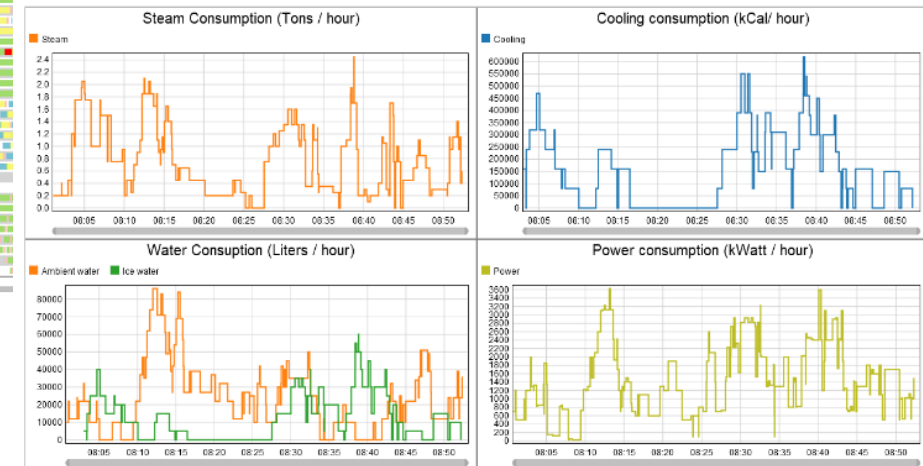
Within the last years simulation tools have increased in effectiveness, and hardware has developed dramatically into a practical planning and operations tool.



Plant design and operations improvement



Production reports simulated in brewing, beer processing, logistics and utility



Production structure analysis / Dynamic Master planning

Your tool for strategic production planning



What does the future bring?

Can you match production capacity with sales forecast?



- Are you planning changes in production capacities in due time
- Are you overspending Capex and Opex?
- How do you reach profit maximum from your milk pool?
- Do you have full transparency of your milk solid balances?

What if...

...the world is even more dynamic than your planning?



- Market changes?
- Product mix changes?
- You operate multiple production sites and lines?
- You need to compare several scenarios?
- You need total overview of potential bottlenecks from milk intake to finished goods warehouse?
- You would like to keep options open for new opportunities?

SDG Initiator Audit - output in short

Connects corporate strategy with local actions and capabilities



1. **Expert assessment of the factory** – opportunities for savings and SDG Improvements are found and business cases are made on each.
2. **Prioritized List of investments in improvements** – based on payback time and SDG effect.
3. **Benchmarks of the factory** – Substantiating and motivating implementation
4. **Action plan** - Taking resources and production into account
5. **Organisational learning** – Methods, tools and mindset for sustainable continuous improvement are provided and taught

So, which technology will win?

Likely all will play a role – and they will all give us valuable expertise along the way



Plant proteins



Insect proteins



Biomass
fermentation



Precision
fermentation



Cultured meats

How close it is to the animal equivalent

How close it is to market



Selected projects



Design of full-scale precision fermentation plant for HMOs

NIRAS supported Chr. Hansen, now part of Novonesis, in designing a precision fermentation plant for producing human milk oligosaccharides (HMOs).

Our services included:

- Evaluation study
- Conceptual Design for all traditional architect and engineering disciplines in relation to the establishment of production facilities for hygienic food ingredients production, including design of processing lines, utility and civils (construction, HVAC, electricity, automation, drains, fire, and energy)
- Project Management

Client

Chr. Hansen / Novonesis

Project duration

2021-2024



novonesis





Design of fermentation upscaling facility

NIRAS assisted the Danish Technological Institute in designing their Biosolutions Technology Center, a facility for upscaling fermentation-based biosolutions, microalga research, and bio-separation

NIRAS' scope included process, civils, utilities, balance of plant, amongst others.

Client

Danish Technological Institute

Project duration

2023-2024





21st BIOs precision fermentation pilot plant

NIRAS services included:

- Project Management
- Planning and design of upstream and downstream equipment
- Design of all utility and civils parts in order to meet 21st BIO's requirements for hygienic processing as well as requirements for visitor areas and functionality
- Design, tender, contracting, construction management and commissioning of all disciplines
- The brownfield project was executed while other operations in the building had to be fully functional

Project duration
2022-2024

21st
BIO

Atria Finland, New Greenfield Poultry plant



Project description:

The Senior Management decided to start working on a strategic overhaul in order to align the (future) production with a growing market. Based on this, it was decided in 2018 to start a Masterplan Phase for investigating different scenarios for how to meet the future volume demand, including both brownfield as well as a greenfield facility with a total capacity of 15000 bph.

Atria Finland, New Greenfield Poultry plant

Masterplan Phase

NIRAS was involved in:

- Assistance to the Senior Management in the investigation of different scenarios for how to build the future production setup
- The development of different production layouts including the facilitation of workshops and involvement of key equipment suppliers in close cooperation with the Client's highly skilled project team.
- Preliminary Utility Design for refrigeration and process ventilation.
- Assisted client's management team in preparation of presentation material and decision basis for the top management, including Capex budget for process equipment and utility

Conceptual Design Phase

After the "Design Consideration Phase" the senior management decided to proceed with the conceptual design for the establishment of a greenfield poultry plant with a capacity of 15000 bph.

NIRAS was involved in:

- Further development of the process layout.
- Facilitation of the contact and work sessions with key suppliers.
- Construction of a simulation model (Digital Twin) of the future production plant and test out relevant scenarios with different product mix and volumes. Use results as input when choosing the optimal future production setup.

Hørkram Foodservice, Denmark

Expansion of logistics distribution center

Expansion of 30,000 m² including logistics, dispatch, cold storage, meat department and fish department in Sorø.



NIRAS services:

- Master plan
- Project management
- Layout and factory planning
- Ventilation, refrigeration and electrical installations
- Elaboration of budgets
- Design, tender invitation and contracting for building works and cooling equipment
- Construction management and supervision
- Testing and commissioning

Tican Brørup, Denmark

Upgrade/extension of the existing plant & New Blast Freezer

New quick cooling tunnel of 820 pigs/hour and expansion of existing cooling room.



NIRAS services, building and civil works:

- Layout of the extended production area
- Project management
- Environmental approvals
- Elaboration of budgets
- Detailed Engineering/Design, fire regulations and static calculations
- Construction management and supervision
- Testing and commissioning



SCALE UP FOR PLANT-BASED PRODUCTS

NIRAS was engaged by a plant-based product manufacturer to scale up a pilot plant for competitive market production. The client aimed to extract ingredients from beans for a versatile food plant, considering both unknown locations and integration with existing sites for downstream processing.

The initial standalone extraction plant design was supported by NIRAS through requirement clarification and a business case analysis, resulting in a conceptual design and a CapEx estimate with a 40% accuracy margin.

Client

Confidential

Project duration

2022

Norsk Kylling / Norway

Chicken Slaughterhouse

Master Plan, Design to Tender of Process Equipment, Refrigeration Design, Building Co-ordination for Greenfield Chicken Slaughterhouse in Scandinavia



- Capacity of 13500 bph, extendable to 15000 bph
- Audit of existing factory
- Site visits with the client as part of a technical upgrade of the client team
- Considerations regarding future product and production programme
- Technical development plan
- CAPEX and OPEX analysis, new versus existing factory
- Financial feasibility
- Design and tender of process equipment and refrigeration plant.
- Coordination / BIM controlling of civil and process design model
- Engineering follow-up on process and refrigeration contracts

Pukyung Pig Farmers Agricultural Cooperative, Korea

New pork and cattle slaughterhouse of 60,000 m² with a production capacity of 4,500 pigs/day and 700 heads of cattle/day



Services:

- Review of Master plan
- Re-design layout & flow
- Design to tender for main process equipment
- Demand specifications for refrigeration



Protein from grass

NIRAS acted project leader in designing and constructing the new full-scale BioRefine plant in Nybro, Jutland. The plant extracts protein from grass and alfalfa that can be digested and absorbed by monogastric animals. The remaining material is used for energy today, though a higher value application would be beneficial.

NIRAS supported BioRefine in developing the process, achieving financial support and in engineering the civils, utilities and approvals needed to establish the factory.

Client

BioRefine - DLG, Danish Agro and DLF

Project duration

2020 - 2024



MAPLE LEAF, Canada

Chicken Slaughterhouse, 2016-2018, 2020

Master Plan and layout (2016-2018)

- Capacity: 2 x 13500 bph, extendable to 2 x 15000 bph
- Initial challenge workshop: Validation of existing plans followed by prioritization of focus areas
- Considerations regarding future product and production programme including strategic impact on new factory capacity and capability
- Layout workshops with all main suppliers
- Simulation model of slaughter, process and packaging area.
- Technical and physical development plan
- Conceptual Design for Refrigeration and Process Ventilation
- CAPEX and implementation plan
- Considerations regarding optimal strategy for energy consumption
- Considerations regarding use of by-products
- Input to financial feasibility
- Tender documents and assisting Maple Leaf in the tender process

2020:

Updating simulation model to reflect changes done in product mix and process design since 2018 and run new test scenarios

NIRAS adds knowledge and experience from greenfield poultry planning.

The Client Team is highly experienced in detailed planning and engineering but realise that they need a second set of eyes on their own considerations as well as a project facilitator to drive discussion and decisions forward without bias from internal political issues.



MAPLE LEAF, Canada

Chicken Slaughterhouse

New chicken slaughterhouse (and rendering plant) with a capacity of 2 x 13500 birds/hour

Quotes:

CEO Michael McCain, November 2018:

"The plant is expected to be one of the most technologically advanced poultry-processing plants in the world, incorporating leading-edge food safety, environmental, and animal welfare processes and technologies. Construction at the London site is expected to begin in the spring of 2019, with start-up planned for the second quarter of 2021".

VP Operations Lou Cappa says:

"The workshop approach developed and facilitated by NIRAS secures a high degree of confidence that the optimal solution has been chosen. Experience from other factory planning in other industries pork and beef processing with regards to overall factory layout has been integrated by an extensive number of factory visits in Europe as part of the planning. Design validation for the full installation has been carried out using dynamic modelling. This has allowed the operations management to secure the plant functionality to meet production forecasts for specific production weeks at start of production and future operation"

"This project has been a true collaboration effort and will continue as such. There is a level of trust that has been built up over time and will only improve both business and the project overall. I could not have imagined a better team. The NIRAS team has been a pleasure to work with - always extremely professional and the NIRAS insights have been very important part of designing this state of the art poultry plant".

DANISH CROWN, Denmark

Greenfield Cattle Slaughterhouse, year 2011-2014

30,000 m² high-tech cattle slaughterhouse with a capacity of 110 heads of cattle/hour.
Based on the newest technology and modern principles with a focus on quality management and energy optimization.



Services:

- Client advising and project management
- Technical advising – layout
- Design, tender and contracts for building works and utilities
- Design, tender and contracts for refrigeration and ventilation plant

Environmental approvals

- Follow-up, supervision and Commissioning of Refrigeration, Vent and Electrical installations

Nortura - Norway

Plan for Upgrade of Meat Processing Capacity 2018-2024

Project description:

Nortura has involved NIRAS in support to the project teams with considerations regarding development of future meat processing capabilities in Norway.

On several different factories in Nortura, work includes

- Initial capacity and capability studies/master planning "Ide- og konseptfase"
- Conceptual design "Skisse/forprosjekt"
- Design to tender of process plant, utility installations and building works "konkurransegrunnlag til totalentrepriser"
- Engineering follow-up, test and commissioning
- Specialist support to General Contractor
- Environmental evaluation and support in permitting
- Operational improvements as part of design considerations



Case: Total Water Management at Carlsberg

Case: Total Water Management at Carlsberg

With the assistance of NIRAS' experts, Carlsberg has taken an important step towards fulfilling its ambition to secure zero water waste at its breweries, including a target to halve the overall water usage. The new plant will thus reduce average water consumption at the brewery from 2.9 hl of water per hl of beer to 1.4 hl of water per hl of beer.



Energy mapping, - Arla example

Target: Creating basis for the utility CAPEX budget for the next 4 years

Focus areas:

- Electrical power supply and transformer installations
- Boiler plants, incl. CHP installations
- Cooling Plant
- Compressed Air
- Water treatment and water distribution
- Wastewater treatment
- HVAC installations



Heineken

<https://www.niras.com/news/heineken-inzp/>

HEINEKEN, the world's most international brewer, has achieved a new milestone in its journey to Net Zero, signing three additional partners, NIRAS, Arcadis, and Royal HaskoningDHV for its global Net Zero Production programme, bringing technical expertise to support HEINEKEN's global ambition to reach net zero in scope 1 and 2 by 2030.

NIRAS partners with HEINEKEN to support carbon reduction efforts at breweries



"We are delighted to be able to support HEINEKEN in their i-NZP programme and continue our longstanding cooperation. Sustainability is key to NIRAS and we have invested in building knowledge around this area for many years. By combining this with our deep insight and experience within brewing, we look forward to supporting HEINEKEN's global ambitions to reach net-zero on scope 1 & 2."

-Thomas B. Olsen, Executive Vice President, NIRAS

