



Arctic Investment Platform

Feasibility Study

Annexes

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Introduction to the Technology Readiness Level

It is common to use the Technology Readiness Level (TRL) as a scale to measure the maturity of an innovation and its proximity to the market. An illustration of the TRL steps toward market entry is presented in *Figure 1* below. This study did not emphasise fundamental research but later stages of the TRL scale that relate to post-prototyping and activities for which an industrial environment is needed to move closer to a bankable investment project (post-TRL5/6).

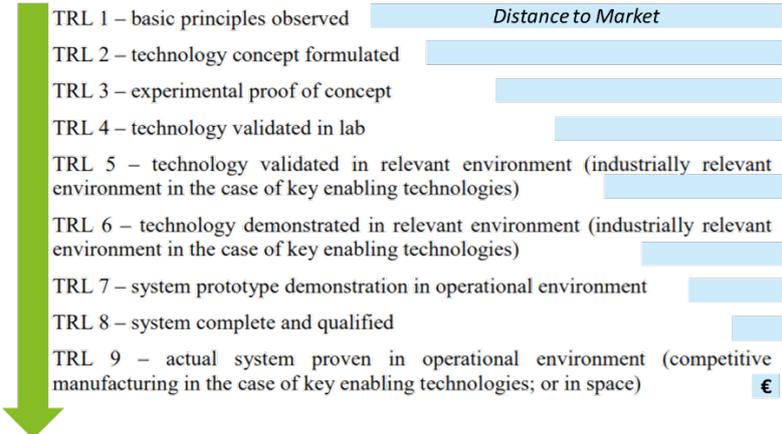


Figure 1: Technology Readiness Level Scale

Source: the authors, adaptation from the European Commission¹

¹ See https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf

Investment Case Study Summaries

This document depicts the 9 showcases developed in the context of the Arctic Investment Platform Feasibility Study, including:

1. A short introduction on the broader context of the case;
2. A description of the case, its scope and modus operandi;
3. A description of some of the key features of the investment gap(s) under the scope – such as the investment size;
4. An analysis of the expected benefits and the value added by cross-regional collaboration;
5. Some key conditions for success or risk factors associated to the case;
6. Suggestions on how public support can be mobilised in a cross-regional fashion.

Case 1 – Enabling the Expansion of an energy-independent Tourism Village

Context. Business expansion lending and risk capital in general are difficult for tourism SMEs to access. SMEs in this sector are also not often eager to file for debt finance due to their risk-averse culture. In addition, they face costs (such as energy expenditures) that hamper their growth as they lower their investment capacity. They also lack advisory support from financial, business and marketing advisors that would facilitate their upscale.

Case Description. This first case consists of attributing an expansion loan to a resort village building its added value on all possible local features. When settling in a region, the resort:

- Builds houses in a traditional local fashion and therefore collaborates with local wood building and construction companies to gather the right expertise;
- Sets alliances with local adventure, entertainment and tourism service companies specialising in local tours and activities;
- Organises partnerships with local food providers, cafes, etc.;
- Etc.

The business model therefore relies upon the local colour of its package, requiring the SME to collaborate with local businesses to generate value. A unique investment would be needed for the resort to expand. The expansion as such would be a 5-year project and less popular destinations could be targeted. In order to reduce the risk, the project could be organised as a joint investment operated by a consortium bringing the resort together with its local partners so that a mix of debt and equity could be organised via mezzanine funding. Not only NSPA but also other regions (in Denmark) could be part of the project.

The project would therefore be supported through an “*Arctic Investment Fund*” to serve as a platform and vehicle to connect players, experts as well as public and private investors. It would rely upon simple rules.

Characterising and addressing the investment gap(s). The setting up of each resort would amount to €10.000.000,00 – resulting in a total investment of €50;000.000,00 for 5 resorts and €70.000.000,00 for 7 resorts. The energy plant itself would cost between €1.000.000,00 and €2.500.000,00 for each resort.

Alternative illustrative case: debt finance is also relevant to lower investment amounts. An example was depicted by several interviewees that touched upon a ‘reindeer chips’ company willing to scale up and access international markets. This company, in need for an internet platform, would need to produce more and automate its production as to facilitate its integration into global markets and face growing demand. It could have a facilitated upscale through a better integration across NSPA value chains and sell its packs (each pack of chips is €5). The company would see its sales raise from nearly 60.000 packs per year to much larger numbers with a much lower investment entry level. The NSPA collaboration would allow the company to grow and internationalise faster by unlocking investment and connections to relevant players along the value chain.

Targeted Benefits and Cross-regional value added. The following benefits would be drawn from this project:

- A yearly turnover of €10.000.000,00 per resort;
- A total of 4.000 employees;
- Lower energy costs would foster the financial capacity of the SME to scale up;
- Risk reduction through diversification;
- Circulation of know-how;
- Critical mass of funding;
- Energy independence and resulting environmental cost (CO2 reduction);
- Higher turnover and profits for the company;
- New business opportunities for all businesses involved across the targeted NSPA regions;

Cross-regional collaboration would allow for the generation of spill-overs to each of the NSPA regions involved through the generation of turnover and profits for the businesses involved but also the catalytic effect (attraction of more tourists and expenses of these tourists in other local shops and businesses when visiting the resort).

Conditions for success. Many organisations should be involved in the process. Besides entertainment (visit/activity) and construction companies, the energy company to set up the plant in each village but also marketing and tourism promotion agencies, local food producers (including farmers and fishers), as well as transportation (transfer, taxi and ferry companies) should be collaborating with the resort business. When considering the energy power plant option – which is a risk factor – relevant authorities should also be involved in coordination with the technical experts.

The project is therefore complex and relies upon the ability of the company to set up a strong network of suppliers and partners. Global companies such as multinational tourism businesses are also competing on the availability of tourism attractions.

Attracting private investors and facilitating the connection between players is therefore important to ensure that the business taps into the broader set of opportunities offered by the NSPA.

Public Support. The project could be supported by a Mezzanine funding bundling lending and (quasi-)equity. Such approach would allow for de-risking the investment by bringing all players in the same project in the form of portfolio. A mix of minority public and private support would involve 1) a guarantee over the investment provided by public authorities 2) possible cross-regional public finance as well as 3) private finance. NSPA regions would have a minority role but would design the specifications of the investment in the context of an “*Arctic Investment Fund*”.

Case 2 – Digital solution testing and adoption by adventure service SMEs

Context. Tourism SMEs do not tap into the full potential of digital technologies. While many started to develop digital capabilities, a lot still lag behind. Companies also miss the opportunity to specialise and often keep competing on a very same type of product; this fosters the fragmentation of the tourism services landscape, making it more difficult for investors to scan and identify possible leads. It is comforted by the usual lack of support to service innovation.

Case Description. The present case focuses on the segment of adventure companies in the tourism services sector. It consists of an investment approach to digitize micro- and small companies in the touristic adventure sector. As such, the showcase is to develop as 1) a strategic and operational matchmaking network and 2) support to innovation activities with a first pilot on the digitisation of small “adventure” businesses in the tourism sector. It draws upon the facilitated diffusion of various digital technologies and techniques such as virtual reality (VR) or gamification. The investment would consist of a clustering effort to connect value chains (digital/tourism) and support the testing of new technologies by tourism (adventure) companies. The first stage would consist of designing a common vision for the network members to result in a common strategy. The following phases could apply:

1. Strategy design and organisation of the network by the public sector during the first year in close concertation with key stakeholders;
2. Involvement of intermediary organisations (regional tourism organisations, representatives from regional innovation environments, etc.) to connect cross-regional ecosystems in the first one and a half year;
3. From the second year onward, organisation of thematic workshop sessions to organise collaborations 2 to 3 times per year – with a thematic focus (starting with the topic of digitisation which would therefore require the involvement of digital companies and/or research and technology organisations for instance);
4. Organisation of the support system with an emphasis on funding.

Such platform would encourage the risk-taking behaviour of companies and could be used as a structural and strategic instrument to match players across value chains, including beyond digitisation toward construction, etc. Public entities could organise innovative ventures to support the implementation of the support system.

Characterising and addressing the investment gap(s). The first investment need in this context relates to the coordination and matchmaking efforts to be made. The collaboration risk should therefore be covered by public support and the cross-regional collaboration would justify a joint NSPA investment in such network and the support provided.

While lending is accessible to small tourism companies, their approach is rarely risk- and investment-oriented. The gap would range from €250.000,00 to €1.000.000,00. Examples in digital packaging, gamification and big data areas have set the illustrative benchmark for a ceiling of €1.000.000,00 for each project, such amount being the highest possible investment in such project.

Targeted Benefits and Cross-regional value added. The network would allow for a better branding and a new way of competing with other destinations outside the NSPA. The cross-regional collaboration would allow for best practices exchange and better knowledge flows across regions. The network would eventually facilitate more than the digitisation of small tourism businesses with:

1. Critical mass of funding (toward a common challenge)
2. Long-term strategy and risk reduction
3. New services and new packages
4. A more tangible dimension for investors to invest in tourism businesses
5. Higher turnover
6. Higher profits for destination companies
7. Economic spill-overs to the regions including growth in employment
8. Digitized tourism companies

Besides the digitisation of tourism businesses, this investment case would lead to an increased number of tourists and touristic flows (higher frequency in the visits), higher added value services (unlocking other types of users who could afford higher prices for instance), as well as a better packaging of the services offered. To another extent, digitisation appears to be a relevant way to overcome long distances and allow for a greater connection between NSPA ecosystems.

The value added by cross-regional collaboration in that context would be first observed in terms of decreasing fragmentation and inefficient duplication of adventure products. It would also consist of the connection of complementary capabilities across value chains, allowing for technological cross-fertilisation, diffusion of experiences and practices, as well as the harmonisation of the overall economic landscape.

Conditions for success. There is a clear coordination need in this case where a supervisory entity should raise awareness and create the environment for inter-value chain connections to take place. The network set up in this business case would gather organisations working on digital packaging, marketing, administration, etc.

Regional tourism, promotion and development agencies, destination companies and businesses across the tourism and digital areas but also other target sectors as well as research and technology organisations are to be structurally involved in the network.

The approach should be based on a trial-and-error approach where the condition to gather companies is to show attractive promises on Returns on Investment (RoI). It can start with a limited size and progressively expand while demonstrating its relevance.

Public Support. The support model should build upon a grant scheme to support digital technology testing and adoption projects in the range of €250.000,00 up to €1.000.000,00. Sponsorship could be offered depending on the work programme of the network and new peer investment models could be fostered: for instance, a resort going through an expansion process could receive an in-kind contribution from a construction company reimbursed with future benefits. The costs of setting up the network of entities to be matched (tourism companies, technology providers, etc.) and to support the networking of companies across regions could vary depending on its ambition: for instance, a network only focusing on the digitisation of adventure SMEs would have a lower cost than a network with more themes to support. The activities carried out might also influence the costs of this network: monthly interactions would require more manpower than the organisation of two single events each year for instance.

Case 3 – Demonstrating the Use of Argon in Steel Making

Context. Circular economy offers numerous opportunities, ranging from the demonstration of geopolymer materials and their optimisation (with similar practices observed in Finland, Norway and Sweden) to the identification of by-product needs and opportunities in geological and mining sites across Regions.

In the area under the scope of this case, the usual scale-up company is an SME reaching the mid-cap scale (less than 500 employees for a total yearly turnover of 70.000.000,00€) with an internationalisation strategy. Scale-ups mainly face an investment gap at the level of the pilot phase of their innovation process (Technology Readiness Level 7) for which there is no easy access in at least one of the 3 NSPA countries. This is the source of relevance for cross-regional collaboration which can bring a critical mass of organisations and funding but requires a phased approach due to increased complexity – requiring a “one-stop-shop” setting for any cross-regional pilot and/or demonstration initiative.

Case Description. This case concerns the circular economy process in steel making, turning a waste which used to be directed to the land fill into a possible resource. This case highlights the possibility to connect forest and industrial value chains across regions. The ambition would be to close the loop between forestry and steel industries by demonstrating the symbiotic use of a steel-making by-product (argon gas) and its replication from the mining and forestry sectors.

Through a decoupling process, the goal of this business case is to demonstrate the use of argon gas in the steel-making process and closing the loop with the wood industry. The steel-making process induces the use of a large quantity of argon gas that could be gathered from the pulp industry.

In this very case, the Northern Regions of Finland, Sweden and Norway would be involved (with the possibility to extent to other countries such as Poland). Steel-making and pulp-making sites at a distance of 100km from each other would be required, with a progressive expansion foreseen from one region to another (when a prototype is scaled up in a region, the next phase would be to target the next closest area). The project would take place in 2 phases in that sense: the first would focus on the closest regions while the second would consist of the upscale of the chain across borders.

Such demonstration project would take at least 2 years (including 1 year to organise the consortium chain) and would last up to 3 years in total. Stakeholders to be involved in this project would include service companies specialising in the area of circular economy, industries from both sectors, as well as the environmental authorities from all 3 countries (to provide a common framework based on the 3 environmental legislations).

Characterising and addressing the investment gap(s). Several bottlenecks are faced in the context of this business case:

1. First, a lack of critical mass of funding hampers the deployment of the project through the implementation of piloting and demonstration activities;
2. The network of experts who should be involved (in the form of a support Expert/Advisory Board to evaluate the soundness of cases and act as network builders) is also a missing block that would facilitate the development and implementation of the case;
3. Many organisations do not have resources to run after complementary funding which is competitive, risky and difficult to access while not even covering all investment needs in this case;
4. Demonstrating argon across value chains requires a combination of actors, value chain segments, technological capabilities that requires another form of intervention.

This case has reached a high level of complexity in its upscale phase, involving numerous players and implying a higher investment risk. While logistics are not a costly issue, two gaps were identified:

1. The range of “*pilot support investment gap*” is €100.000,00 to €300.000,00. Such investment is needed to convince users before triggering the demonstration phase.
2. The demonstration process for this business case ranges from €1.000.000,00 to €5.000.000,00 and no sound financing options can be found for the chemical process.

A possible replication would involve a more limited investment (€5.000.000,00) for a cost of the project – including replication – of max. €10.000.000,00. Triggering investment in such context implies that safety is demonstrated early (to show that the process can work in a safe fashion by an illustrative “*95% level of certainty*”).

The private sector struggles with such investment because of the amounts to be invested and the fact such business case should involve a minimum of 3 to 5 companies (complex setting). Another difficulty is information-related as many (public/private) investors struggle to understand the ins and outs of circular economy in practice. Such obstacles limit the access to market-conform debt finance, as well as to money that is not fully dedicated to circular economy.

Attracting private investment would require de-risking and therefore a hybrid support model as depicted above. Highest risks should however be addressed by public support and mainly at the piloting stage. The support deemed the most relevant in this case would be made of a combination of debt and grant money, including a grant covering 50% of the project and a loan (which would not be repayable in case of failure) to cover the other part. It would be divided into funding steps to optimise the funding of the recipient: the first phase could for instance be covered by a 100% grant and when the financial potential becomes clearer (including to pilot the efforts of convincing organisations to provide their waste streams), go down to 75% and 25% cost coverage until TRL7 is reached, - while debt money would be involved along TRL7-8.

Targeted Benefits and Cross-regional value added. Linking capabilities and value chain segments (closing the loop from waste to primary resources) is a first value added brought by such business case. Many other benefits would be drawn from this project, including:

1. An increase in turnover;
2. New products to be commercialised;
3. New processes;
4. Less Co2 emissions;
5. Reduction of material use thanks to decoupling techniques;
6. Economic sustainability thanks to the decreased use of raw materials and savings related to the reduction of logistical flows implied by the constant import of chemicals from other EU countries;
7. Manufacturing in NSPA now, so also more ecological and more economically interesting;
8. Connections across different value chains – a critical success factor in that case.

The value added by cross-regional collaboration would in that sense be multi-fold:

1. Risk sharing is a first point. Involving more entities would allow to reduce the risk of undertaking this risky initiative with promising benefits;
2. It would also allow for the necessary upscale required for such project, not only in terms of investment but also...
3. ... in terms of involvement of enough organisations into the implementation of the case – bringing a critical mass of players and connecting value chain segments at the same time;
4. The involvement of more stakeholders allowed by the cross-regional setting would allow for a greater level of resources but also new opportunities to build around new business ideas from their involvement.

Conditions for success. The first requirement to undertake the implementation of such business case is to 1) know about product flows and 2) know about circular economy companies in the regions. A solid base is also required for this case to be successful: having the right focus, the right roles for each organisation involved (based on real organisational strengths but also comparative regional assets) is necessary.

A key condition for this case to be successful is therefore the effective networking across regions. Such networking should take place between cluster organisations in the first place but also experts (whom would be called upon to constitute a cross-regional Expert Board/Network). From a more practical perspective, the “neighbouring factor” appears to be a constraint: such case requires a geographical proximity to avoid additional logistical and economic but also environmental costs that would defeat the purpose of the model. Having local partners is particularly key to building the infrastructure and bringing in the regulatory knowledge and expertise concerning key framework conditions associated to the targeted regional markets. The Expert Network would in that sense play a key role in facilitating the exchange of experience, best practices, etc. Its set-up is seen as a critical part of the project.

Besides the technical risk inherent to such kind of project (which involves technological risk and economic viability uncertainties), other risks could be identified: for example, such case would not only build upon a customer-provider relationship but involve an entire value network, implying the design of a long-term agreement to sustain the circular model. In case the pulp industry would confirm its position of new customer in this setting, such long-term agreement would have to address the issue of access to by-products, with the risk of possibly losing a segment in the circle should a failure to reach this agreement be faced. Another risk is associated to the demonstration of a sound case of how to share the “win-win cases” initially presented to consortium players as to demonstrate the value of turning waste into value and build a common vision around such approach.

Public Support. Several public policy instruments could be mobilised to drive investment into this area, from direct funding in the form of grants to the use of innovative public procurement. New incentives (not limited to tax schemes) could be designed to support the transition phase so that public (regional, municipal, etc.) authorities foster the uptake of circular economy through green procurement for instance.

Possible combinations could be based on previous exploration across Nordic regions and possibly involving other countries. Complementarities between some of the countries were identified to be further operationalised in the coming two years through a knowledge exchange programme for instance. Exchanging experiences in terms of policy making remains crucial to highlight strengths and missing assets in regions as to establish the ground for a strong coordination. Concrete actions are deemed necessary and a first strategic step would be to harmonise the approach toward scrap steel and steel slack which is currently considered a waste in certain countries (Sweden, etc.) while earmarked as a by-product in others (UK, Finland, etc.).

Case 4 – Data and Manufacturing Heat for Fish Farming

Context. Data centres and manufacturing plants produce heat that has negative environmental effects. Power-intensive sectors could however be used as to serve other value chains, providing heat and waste as a primary resource to other industries.

Case Description. This case consists of a circular system (closed recycling) across 3 main value chains. 3 data centres, 1 manufacturing firm and up to 3 food production companies would share 55 hectares where agri-food production would co-exist with data and manufacturing centres in a sustainable way. The focus is here on the heat production and use for large-scale rainbow trout farming, using the heat from the surrounding industries to grow a food and fish production park.

Companies would set up the hub in a Swedish region where one can find both low-cost and sustainable energy production opportunities, and therefore attract energy-intensive industries in an easy and sustainable fashion. Norwegian fish farmers could set up a branch in the region as to benefit from a lower-cost production site.

Besides companies, energy clusters but also local and regional governments should be involved to generate relevant permits. Air and energy transportation but also tracking would have to be organised from one production site to another, requiring R&D efforts to quantify the costs and terms of the contract between all parties involved. Such project would take about 5 years in total, including the time needed to set the packaged offer to present to companies, the setting up phase, etc.

Characterising and addressing the investment gap(s). The key to this case lies in both scale and connectivity. Such ambition requires communication in the first place as well as match-making efforts. Supporting companies' efforts in exploring the feasibility of such circular setting is part of this match-making and awareness raising approach. The first line of concern is therefore the one of coordination.

Such project also implies innovation, and thus risks that in this case require public support. Companies are indeed eager to fund their own activities but the connection across businesses is an area that requires public support/co-investment.

Targeted Benefits and Cross-regional value added. Sustainable energy is the first output leading to a reduction of CO₂. Using the right energy source in the first place (sustainable electricity) would enable all 3 value chains involved in that respect. The use of excess energy is a second benefit from this case.

It is combined with the generation of economic benefits which rely on the fact that food production would not have high costs for heating:

- The data centres and manufacturing plants would receive a payment for their heat (instead of expulsing the heat in the air) and the food producers would buy cheaper and more sustainable energy to warm up their fish tanks – at a cheaper rate compared to usual utilities.
- Other benefits can be expected from this cost-saving and income-generating approach, such as:
 - A higher turnover for the companies involved
 - Higher profits
 - New jobs (growth in employment)

The value added by cross-regional collaboration in that context first consists of the connection of capabilities across regions. It also allows for making a bigger investment in a site that generates benefits for companies coming from other regions on a model that can then be replicated to all NSPA regions.

Such approach at the level of the NSPA would reduce the unbalance between sparsely populated areas and large urban hubs, with the definition of a comparative advantage – the one of sustainable energy production and use for manufacturing.

Conditions for success. The process called upon to set up such consortium of businesses is a complex one. The starting phase of this process is the most critical one as the business case is to be analysed, depicted, packaged, and circulated in a proper way to companies after an intense outreach effort.

Funding for companies to settle the case is also important as an incentive is necessary to trigger and deepen the interest of the companies involved.

Long-term commitment is also required for such arrangement: given the size (not possible to quantify before the feasibility analysis) and nature of the investment, companies could not expect benefits to be visible in Year 1 and should have a long-term visibility on the implementation of the mechanism. To buffer for the risk of seeing one of the partners go bankrupt or not fulfilling its commitment, transparency would be important (given the fact that companies have no control over each other's internal processes).

Public Support. In that context the support required would take the form of a grant. Private co-funding is required, and a 0% public support rate could be applied should the company be a large corporate. Between 5% and 35% co-funding would be sufficient to support companies in the setting up of such project. Support would be particularly important to the collaborative component where branding, building the business plan, organising the technical collaboration, etc. would be an extra-cost for the businesses involved. The most risky part in that sense – and therefore most important to support – would be the feasibility analysis to map energy production, excess and use across partners as well as the business features necessary to convince company decision makers and possibly investors.

Case 5 – Demonstrating Distributed Energy Production using Biomass Locally

Context. A critical step in scaling up small businesses is associated to the upscale of their system(s) and prototype(s) to an economically viable production level. Technology adopters and new product users require some proof of technical and economic reliability which usually comes out of the so-called demonstration phase before they can engage into buying it. Small companies thus need both references of the new technology they bring to the market as well as proof of its reliability.

Case Description. The present case addresses the lack of capital in the early phases of technological demonstration (technology readiness levels – TRL – 6 and 7). It consists of a cross-regional demonstration project on distributive energy production using biomass that is produced locally. Any bio-waste could fall under its scope (sludge for biogas production is an example; the project could also build upon side streams from mines and pulp mills).

The project would encompass testing and demonstration activities for a model to be further brought to the North of the Arctic area, in order to demonstrate the ability of the technology to be used in harsh conditions. Demonstration would be operated at -30° for multiple purposes (transport, etc.) with an emphasis on transportation.

The biogas generated out of the process developed could be used for any type of energy production. The project as such would build upon a collaborative model involving procurement agencies, research and technology organisations necessary to the development, as well as the private business(es). The overall goal would be to replicate such approach to the entire NSPA, leading to the multiplication of such plants across regions.

Characterising and addressing the investment gap(s). Equipment, process and material costs can in that context be a burden that small businesses struggle to handle. Innovative activities that still require a lot of development but are close to the commercialisation stage fall under the constraints of the State Aid Framework for R&D but still are too risky for the private sector to invest in them.

The project would take maximum 5 years before reaching a proper level of profitability for the business provider at the core of the development. Its overall amount would be €5.000.000,00 maximum – possibly less.

Targeted Benefits and Cross-regional value added. Many benefits could be derived from such initiative, spanning from economic to environmental benefits – including for instance:

- Business turnover and benefits
- Less dependence on gasoline
- CO2 reduction
- Energy independence (with the possibility to create one's own fuel) out of less import dependency
- Retention of capital in the NSPA regions;

The value of cross-regional collaboration would go beyond building up a critical mass of customers and investment in that case. It would also consist of

- The insurance of available biomass (thus bioenergy) across NSPA regions, making proper resources available to cross-regional transportation systems;
- A faster upscale of the technology which would be first deployed to smaller communities before building upon bigger ones across the NSPA regions;
- Allow for replicability across regions that are facing similar/common energy issues and challenges (temperature, dependency, environmental costs, etc.);
- Cross-regional economic spill-overs through the involvement of local companies in the process of setting up of the bioenergy plant as well as in its replication across regions;

Conditions for success. This project would require an involvement of organisations and companies (including car and truck owners) to provide clients in the first year – justifying the use of procurement for innovation as the right leverage to bridge the deployment gap. Such investment remains costly and risky and therefore a critical mass of end-users – especially lead-users who will be the first users of the technology.

Public Support. The support would take the form of a mix of both private and public funding. It would also build upon the purchasing power of public authorities, where innovative public procurement could be used to steer the deployment to the technology to public sector traffic and transportation companies. This grant could follow the usual demonstration support conditions observed in other contexts.

Case 6 – Young Tree Harvesting Machine Demonstration

Context. In most NSPA Regions, a large portion of the productive area is covered with forest. Forestry can be a vector not only for wood products, but also new by-products related to bioenergy and other uses in the end of the pulp value chain. Small companies however face difficulties to scale up due to limited capabilities. This real investment case emphasises a demonstration support gap that would justify cross-regional investment.

Case Description. This case consists of the demonstration of a harvesting system for young trees. This case is positioned up in the value chain and requires a strong collaboration between the system (machine) manufacturer and the downstream players of the value chain (down to the very end industrial users which are pulp and energy companies).

The machine is currently available in prototype form and is entering the demonstration phase (Technology Readiness Levels 7-8). It is meant to harvest young trees and create a bundle – a big log that can be transported from the forest to the end-user through various transportation modes (rail, road, barks, etc.). The machine is innovative and makes use of two different cranes: the first is used to harvest (in an effective fashion) the trees while the other automatically creates a bundle out of the collected biomass. A final round wood log is then used to finalise the bundle. Large-scale testing and adjustments are still needed to reach a full scale and expand from pulp and energy environments to other areas – trying out new types of wood, new environments, etc.

The machine would standardise the transportation of logs from in-land to the coast where most transformative industries are located. Young trees can then be used as raw materials for wood products but also combustion. The demonstration work however requires quite some work to build an economically viable model for affordable biomass. Besides the bundling machine, the logistical chain is therefore crucial for the product to become marketable. The business case focuses on the energy and pulp value chains before scaling up to other markets as a result of this two-sided demonstration effort.

The 2 to 3-year project would lead to the setting up of a multi-regional demonstration setting with a development centre in one region. Small businesses using young trees to heat communities and companies setting up local heating plants would be a clear test bed across NSPA regions.

Characterising and addressing the investment gap(s). Funding remains available up to the piloting and demonstration stages. Risks then emerge that relate to various market-related factors (such as regulation – e.g. renewable energy directive –, oil price, technical risks, tax regimes, etc.).

The overall demonstration cost would amount to €7.000.000,00. One could note for information that in terms of commercial return and as the cost for each machine would amount €700.000,00 it would take 25 yearly sales for the company to pay its investment back.

Targeted Benefits and Cross-regional value added. This project would lead to an increase in biomass availability for multiple energy and industrial purposes. It would also reduce the obstacles linked to non-standardised log transportation (including the associated time and resources).

It would also contribute to building the appropriate critical mass of investment and users beyond the local market: in this case internationalisation is needed for the SME to reach out to a larger pool of potential buyers. The limited size of the local market is an incentive to cross-regional collaboration as is the relevance of testing the system in different environments. The scale of the NSPA area would be perfectly adapted to the collaborative demonstration sought by the lead company in this case.

Besides the positive economic impacts, positive environmental spill-overs would be generated thanks to the harvesting of a larger portion of biomass. Such perspective highlights two possible benefits:

1. An improvement in the forest health;
2. More possible uses of the forest which biomass can be used not only for combustion but for higher added value products.

Conditions for success. The political and regulatory context has an important role in this case. Tax exemptions for biofuels are an illustration of the role of long-term policy approached to bioenergy which can play the driver role of demand along the value chain. The regulatory context allows for a better planning and a clearer horizon for companies and should be considered from the angle of each value chain segment (bioenergy, road and rail transport, etc.).

Collaboration is an additional key to the success of this case which requires a strong collaborative landscape where ideas can be shared and where business can connect to share the economic risks of innovation. Both value chains should be involved for relevant end users to test the device and ensure a proper standardisation process (feeding systems might vary from one region to another).

As this is an innovation project, both technological and commercial risks apply. In this very context the importance of collaboration adds an additional layer. Relevant customers should therefore be identified in each region to guarantee an appropriate scale and an effective commitment. Local authorities should also deliver relevant harvesting permits.

Public Support. While this project received prototyping support from the European Structural Investment Funds (ESIF) and Horizon 2020, an appropriate level of support is still missing. Cross-regional demonstration support could therefore contribute to the de-risking of private investment in this case. Any public support would have to be made as simple as possible, less risky, with a diminished administrative burden.

Co-funding from the private sector could be brought by end users paying for the price of assortment – in view of lower assortment costs in the end of the demonstration process. This is a particularity of this case which is clearly demand-driven (businesses ask for such solution to see the day).

Case 7 – Anonymous Circular Economy Case

Context. The investment targeted in this case touches upon larger scale-up companies in the area of energy efficiency and circular economy. It aims at developing a cross-sectorial collaboration between two companies to produce resources out of CO₂. Due to a confidentiality agreement with the case developer, this showcase will remain fully anonymous and only key findings will be presented in the next sections.

Case Description. This case consists of supporting a collaborative demonstration project at a large scale. It focuses on piloting and demonstration phases which span across Technology Readiness Levels (TRL) 6 to 8. Such investment usually is a cost driver private business and requires a physical proximity between the private stakeholders involved. The demonstration facility would require a critical mass of plastic waste (from which the resource should be derived).

The on-site conversion is an important feature: the use of plastic waste for a dedicated industrial purpose in a targeted site would cut off the recycling logistics from the supply chain of the companies involved. The by-product generated by this process would benefit the agri-food sector where a clear use case is currently being developed in one of the NSPA regions and illustrates the current investment gap. The project would take between 1 and 3 years to reach a full operational scale.

Characterising and addressing the investment gap(s). The particularity of this case is that it consists of a new establishment set up at the intersection of two value chains. It entails a high level of risk which hampers private investment. For the material at stake, both capital expenditures (CAPEX) and operational expenditures (OPEX) are a heavy weight over the company's shoulders – 20 employees would have to be mobilised to bring the project to scale. The material itself is a harmful one, produced at a large scale but since recently offering a new use opportunity.

Private businesses struggle to reach out to new investors and explain (to some extent "*translate*") the business interest of such case. Gathering private investment for such demonstration effort is in that sense out of their comfort zone.

In this context, the total project amount is €15.000.000,00. It would cover for both pilot and demonstration activities to be undertaken at a large scale.

Targeted Benefits and Cross-regional value added. The targeted investment would allow to constitute a critical mass of funding but also a critical mass of plastic waste. The ambition of this case would be to organise a replication process across NSPA regions, opening a new valorisation opportunity for the regions and justifying the cross-regional investment.

Benefits would encompass environmental benefits (not only through the waste consumption but also through the limitation over logistical flows) as well as a wide range of economic benefits

Conditions for success. The success of this case depends on the ability to prove the technology, process and resulting outcomes viable both technically and financially. A market opportunity is also required for possible investors to join the setting and complement the funding attributed to the project. Branding is therefore a key to the vulgarisation of the benefits of circular economy and especially in this context – which is deemed quite complex. Expertise about the NSPA regions themselves would be necessary to make sure that all opportunities are covered.

Public Support. SMEs usually do not have a solid enough financial track record to rely upon debt money only. A grant would therefore be necessary but would reach a ceiling rather fast.

Public support would in that case take the form of a mix combining a guarantee scheme, a grant (which would be limited to 50% private co-funding – whether in private co-funding or additional private investment) as well as a capital/equity contribution.

Degrressive funding could potentially be applied along the TRL chain. Public support would however have to cover for capital expenditures. Raising capital is an approach that should be incentivised in the context of this project.

Complementary support: A note was shared during the development of this case on the relevance of offering early-phase support to allow for the creation of new champions and in general new industries across the NSPA. Such type of funding is said to be missing across the regions.

Case 8 – Digital Platform for Arctic Tourism

Context. Arctic tourism businesses are often small companies with very high capacity constraints. They also evolve in a fragmented landscape where little resources are available for them to optimally develop and possibly scale up. Tourism demand has however grown in the Arctic and new challenges arise (environment protection, community-friendly tourism, etc.) including for tourism product development.

Case Description. This case would consist of a public-private investment to support the setting up of a cross-regional one-stop-shop for marketing, transportation, ticketing, and VAT management in the area of Tourism. This case addresses multiple needs relevant to cross-regional collaboration and in particular:

- Sub-optimal tourism businesses capacity (time, money, strategy, product development, marketing, etc.);
- Need for sustainable tourism (in both social and environmental terms);
- Tourism seasonality and day-to-day business patterns;
- Risk-averse approach in tourism (lack of trust in investments bringing long – 2 to 3-year – volume increases)
- The need to reassure on the link between investment and consumption volumes.

The one-stop shop would consist of an online tourism platform to offer safe, quality and sustainable tourism packages as to harmonise the user experience, connect value chain segments and reduce the costs for all actors involved. Tourists could use the platform to approach the Arctic as one destination without facing the barriers of regional borders (in terms of route transparency for instance – bus stops, lines, etc.). Two main axes would be followed as priorities for the development of the platform:

- 1) Cross-border traffic (bringing together SMEs, tour operators, etc.); and
- 2) Sustainable low-season development.

Characterising and addressing the investment gap(s). Tourism businesses are small (and in most cases micro-companies). Their structure will vary in size depending on the region. They miss risk capital and deal with the importance of their operational expenditures (OPEX). The lack of investors in the NSPA together with the lack of visibility and clarity over such landscape makes it difficult for investors to select companies and have a streamlined deal flow.

The gap as such consists of the systemic information asymmetry and sub-optimal coordination of value chain segments across tourism areas. While one project (package) would cost between €30.000,00 and €50.000,00, the overall cost of the platform would range between €5.000.000,00 and €7.000.000,00.

Targeted Benefits and Cross-regional value added. Cross-regional collaboration would help tourism businesses overcome the fragmentation of the Arctic landscape.

Among other things, it would allow for the following:

- Harmonised and visible tourism landscape across the NSPA;
- Cost reduction;
- Branding of the NSPA Regions as one touristic destination;
- Strengthening of cross-regional value chains;
- Improved and harmonised user experience across NSPA Regions;
- Safe, quality and sustainable tourism activities.

Conditions for success. A main condition for such project to succeed is the effective involvement of the public sector in three main ways:

1. The destination cities should be involved so that municipal sorting and recycling systems and services are organised in an appropriate fashion. This part of the puzzle is necessary to the sustainable development of Arctic Tourism (also mitigating possible negative spill-overs such as environmental costs)
2. In line with the above, relevant entities under the leadership of municipalities should strive toward green energy and green electricity solutions – with possible support from the State(s) and possibly the European Union.
3. Infrastructural maintenance (e.g. tracks) is also important in developing volumes, especially during low seasons. Efforts will be required to maintain infrastructure and develop them in line with the growing touristic demand.

Public Support. Public support should in that context come in the form of a grant. Companies are usually eager to pay up to 10% of such type of investment which could be the expected rate for such project. A segmentation could be operated so that companies contribute to a different extent depending on their turnover, such as done in the context of Visit Arctic Europe.

Case 9 – Cross-border tourism packages

Context. Despite the rise in demand, tourism is subject to a high degree of fragmentation across the Arctic with a high proportion of small businesses. NSPA Regions are seen by tourists as one area but have multiple systems (transportation, tourism services, etc.) with no one-stop-shop access for travel packaging.

Case Description. The present case relates to the sustainable (social, economic and environmental) development of the Arctic region as one in the context of safe quality tourism. It consists of a cross-regional dynamic travel package platform, building upon the Visit Arctic Europe project which brought together more than 125 companies. Such project could constitute a strong ground to pull the broader system and set up a one-stop-shop Platform to “pick & choose” travel steps. Two drivers are key in that very case: digitisation and customisation combined to individualisation.

This platform would provide the opportunity to end consumers to set up tailor-made and dynamic travel packages which would not only integrate the tourism service (entertainment) component but also the transportation part. The Platform would not be a stand-alone “back-end” platform and would require a complete front-end which would include communication activities, international distribution channels and access to multiple commercial (distribution) points, as well as the setting up of investment cases. The platform should be flexible and modular, allowing for the adaptation necessary to multicultural packages. It should be user-centred and developed in a customer-driven fashion.

It should encompass both packaging and transportation – transportation is an important part of this platform as it is a typical area where fragmentation hampers cross-NSPA tourism. It would include in addition hotels, restaurants, activity companies, rental car companies, guide companies, destination management officers, local tour operators, etc. The platform would address information asymmetries by allowing all smaller businesses to be put on the map and be visible to Arctic visitors.

Alternative (complementary) Case: Another proposed case, focused on the creation of a cross-border transportation system to support companies and communities. Such system would take the form of a Public-Private Partnership (PPP) and could be the first phase toward the setting up of a fully-fledged platform for cross-regional travel packages.

Characterising and addressing the investment gap(s). Tourism companies lack investors and resources (time/money) to think and act strategically. They face seasonality and are therefore in a difficult (unstable) financial position to request loans/investments. Their financial capacity and risk-averse culture lower the usual will of these companies to invest in new developments².

The investment level is therefore quite low and usual co-funding rate appear to be sub-optimal for tourism companies.

The budget would range between €3.000.000,00 and €5.000.000,00 to set up the platform (total budget).

² Tourism companies are said to be usually willing to co-fund up to 15% of project costs in most cases.

Targeted Benefits and Cross-regional value added. This Platform would be the one-stop-shop for Arctic tourism, overcoming by its existence numerous bottlenecks linked to the lack of collaboration across all NSPA Regions. These include among others

- Harmonised ticketing
- Improved consumer experience
- Increase in turnover
- Increase in profits
- Increase in employment
- More secure and stable business results (buffering for seasonality for instance)

Cross-regional collaboration would in that context to creating the necessary connections but also reach the right level of critical mass. The harmonisation of the approach would complement the reduction of inefficiencies due to fragmentation.

Conditions for success. This case builds upon different value chains and would require a consultative effort toward local businesses across sectors (food, transport, etc.). Local communities are also important to consult in the process to ensure a socially acceptable tourism across NSPA regions.

An alignment of skills and competences would also require the building of relevant business cases to federate companies and facilitate the involvement of possible investors.

Public Support. This platform would take 2 years to set up. Grant support would be required to support the setup of the platform. The 3 to 5 million Euro-project could in this case be associated to an expected co-funding from the private sector in the area of 50%.

In order to buffer for the financial risk taken by the private sector at the inception stage, a commission-based model could be developed to ensure a higher Return on Investment (RoI) to the companies involved.