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Beslut om stöd

Stödmottagare: SVERIGES LANTBRUKSUNIVERSITET
Org. nr: 202100-2817
Projektnamn: WaVes - Smart specialisation and innovative biotechnology from Arctic plant derived waxes and nanomaterials
ÄrendeID: 20370398
Diarienummer: REGAC - 360 - 2024

Beslut om stöd

Region Västerbotten beviljar SVERIGES LANTBRUKSUNIVERSITET stöd för att genomföra projektet WaVes - Smart specialisation and innovative biotechnology from Arctic plant derived waxes and nanomaterials enligt ansökan inkommen 2024-10-08. Stödet uppgår till 35,00 % av faktiska kostnader och 35,00 % av total finansiering, dock med högst 1 190 675.

Beslutet har fattats med stöd av förordningen (2003:596) om bidrag för projektverksamhet inom den regionala tillväxtpolitiken och i vissa fall förordning (2015:210) om statligt stöd för att regionalt främja små och medelstora företag.

För stödet gäller allmänna villkor enligt Bilaga 1.

Beslutet kan inte överklagas.

Motivering till beslut

Region Västerbotten beviljar stöd av följande skäl:
Projektet bedöms följa intentionerna i RUS Prioritering 1: Västerbotten - en nytänkande och smart region och mer specifikt delmål 1.3 Utveckling av innovationer.

Projektet uppfyller kraven fastställda i Region Västerbottens Agenda för hållbar finansiering och bidrar i hög grad till prioritetshöjande aspekterna Sammanhållen region samt Hållbar regional tillväxt.

Projektperiod

2025-01-01 - 2027-12-31

Projektbeskrivning

Syfte: The northern region has significant capacity to produce and refine economically valuable biological raw materials for biotechnological use, derived from its natural resources such as needles, berries, and plants. These plant-based products include high-value waxes and nanomaterials. Harnessing their economic potential requires smart

specialization. Our Interreg Aurora consortium has been assembled to bring together skilled regional experts and companies. This collaboration has enabled the production of specialized biotechnology-based products for bioeconomical use. Translating the expertise gained in the production and purification of high-value natural waxes and nanobiotechnology products offers significant potential to boost the regional economy. However, there are currently three bottlenecks in developing this biotechnology in our region. First, more cost-effective methods are needed to extract the proposed raw materials from their sources. Second, practical demonstrations are required to show how these advanced materials can be applied to various biotechnological applications, such as biosensors. Third, collaboration between biotech solution developers and regional businesses is essential for economic development. To address these challenges, high-level expertise combined with technical skills must come together to fully utilize the region's biological raw materials and develop valuable nature-derived products. These challenges are being tackled in this project. The following figures illustrate the market potential of bio-materials investigated in our previous joint projects: The global bio-wax market size is estimated to be valued at USD 2.56 billion in 2024, with further growth projected at a CAGR of 4% during the assessment period. Worldwide sales are expected to reach USD 3.79 billion by 2034. The biosensors market was valued at USD 25.5 billion in 2021 and is projected to grow to USD 48.89 billion by 2030, with a CAGR of 7.5% during the forecast period.

Vad projektets aktiviteter ska leda till för målgruppen på kort sikt:

The WaVes project area forms a cohesive whole, with Sweden excelling in needle wax expertise and a vibrant SME biotechnology cluster, while Finland specializes in berry wax extraction, cost-effective methods, and novel nanotechnology. Cross-border collaboration leverages these unique strengths. In the Oulu area the emerging focus on biosensors and mass roll to roll bioprinting can lead to the development of advanced technologies that can transform healthcare and environmental monitoring. By partnering with SLU and biotechnology SME cluster in Umeå, which is known for its innovative small and medium-sized enterprises, both regions can benefit from shared expertise, resources, and market access. This is complemented by Centria's expertise and practices in natural products. This collaboration can accelerate the development and commercialisation of new biotechnological solutions in both regions.

PrintoCent is a pioneering cluster based in Oulu dedicated to the innovation and industrialization of printed intelligence. This includes flexible, stretchable, and wearable electronics, as well as diagnostics. The cluster brings together over 500 experts and more than 40 international industry member companies, creating a robust ecosystem for developing cutting-edge technologies. One of PrintoCent's emerging initiatives focuses on biosensors. The integration of printed electronics and biosensors in health monitoring patches enables real-time data collection and analysis. New plant-derived materials can be used as components in biosensors. The complementary knowledge-based clusters on both sides of the border provide a fertile ground for innovation and research. Project partners together with collaborators and stakeholders, create a synergistic environment for translating cutting-edge research into practical applications. This fosters innovation and has the potential to attract investment and generate high-value jobs, enhancing the regions overall potential and attractiveness.

Vilka effekter ska projektet uppnå på lång sikt:

The new network collaboration and project outcomes will accelerate the development and commercialization of innovative biotechnological solutions, attracting investments and generating high-value jobs in both regions. This is particularly important for Oulu, where

the biotech sector is still emerging. Although Oulu is home to world-class electronics companies like POLAR and OURA, which focus on digital/optical biosensors for cardiac health, there is potential to expand into new biotechnological areas.

Extracellular Vesicles (EVs) serve as a universal communication system in nature, reflecting environmental factors and stressors in human blood. Given that EVs are also secreted by the microbiome, there is an opportunity to develop new wearables that integrate plant-derived EVs and purified waxes. These natural materials could enable innovative approaches to biosensing, beyond the traditional digital measures currently used.

Additionally, plant-derived EVs are critical to the EIC Pathfinder Nutritional Challenge NUTRIEV clinical trials, reinforcing the role of this project in clinical translation. The Interreg Aurora WaVes project lays the groundwork for using plant EVs as a proof-of-concept to monitor the quality of food and its effects on human health.

We are already collaborating with companies like Polar and Lumene. Polar is exploring the potential of human EV monitoring, while Lumene is interested in incorporating plant EVs into their products. These partnerships strengthen our exit strategy by fostering deeper collaboration with companies engaged in the WaVes project.

There is significant demand for new biosensor solutions and preventive medicine strategies to reduce healthcare costs. The results of this project could drive biomedical companies to incorporate waxes and plant EVs into their product development. We foresee a clear value chain, from raw materials to novel biosensor products, that could revolutionize the wearables market.

Indikatorer:

Namn	Värde	Måttenhet	Kommentar
Antal framtagna kunskapsunderlag, strategier och program.	1	Stycken	Kunskapsunderlag ska utvecklas

Tid- och aktivitetsplan

Aktivitet	Beskrivning	Startdatum - Slutdatum	Kostnad
WP1 - Management	<p>This work package includes both the general management and financial administration of the project. The costs of the work package consist of the working hours of each partner's project responsible peoples for administration, internal coordination of the project, and interaction, as well as the time spent preparing monitoring reports and participating in the project's collaboration meetings.</p> <p>The Lead Partner of this project will be the University of Oulu. The Lead Partner assumes overall responsibility of liaison between partners and the funders concerning the administration and the implementation of the project. The Project Leader (PL) act as a Chair of the Project Steering Committee (PSC) and will appoint the expert who act as a Project Manager (PM).</p> <p>Each partner will nominate a member and a substitute to</p>	2025-01-01 - 2027-12-30	

Aktivitet	Beskrivning	Startdatum Slutdatum	- Kostnad
	<p>represent them in the Project Steering Committee (PSC). The PSC's main responsibilities include steering, coordinating, and supervising the project's implementation. The progress of the research work will be reviewed during the Project Operation Management Team (OMT) and PSC meetings. The Project manager (PM) will convene these OMT meetings, which will be held either online or face-to-face. The team will consist of specialists from each partner participating in the project.</p>		
<p>1.1 - Contacting responsible project partners and funders & creating the co-operation agreement</p>	<p>After the funding decision from funder has been received project leader with nominated PM starts to prepare a co-operation Agreement between the partners. When the co-operation agreement is completed, the PM organizes the required signatures and distributes the agreement to each partner. Lead partners visits to all partners' premises.</p> <p>The following milestone(s) will be used to evaluate the success of the activity:</p> <p>Milestone: Co-operation agreement signed Description: Due Date: 15.02.2025</p>	<p>2025-01-01 2027-12-30</p>	<p>- 1</p>
<p>1.2 - Monitoring the progress of the project, financial administration, and reporting to The Programme</p>	<p>Project Manager will prepare the payment applications sent to the financiers together with the lead partner's accounting person. The application always includes a technical interim report of the reporting period. Reporting periods will be agreed with The Programme.</p> <p>Milestones (M1.1 - M1.6): Joint meetings of the Steering Committee and Project Operation Management Team. Descriptions: These meetings, either as a joint gathering or consecutively on the same day, review and discuss the 6-month progress reports. Due Date: Every six months or according to the timetable provided by the Interreg Aurora Programme.</p>	<p>2025-01-01 2027-12-30</p>	<p>- 686 814</p>
<p>1.3 - Promoting networking and expert exchange</p>	<p>This work package organizes project trips to various company visits and expert institutions, and promotes collaboration and skill development among experts. The work package is led by the project manager and involves all partners and interested companies. Travel grants can be combined with broader announcements.</p> <p>The following deliverable(s) and milestone(s) will be used to evaluate the success of the activity:</p> <p>Milestones M1.7 First call of Travel support grant for visiting partner organisation Description: Open call for travel grants (max 4-5000 euro) for supporting networking between partners and/or other relevant actors in the region. Due Date 30.11.2025</p> <p>M1.8 Second call of Travel support grant for visiting partner organisation Description: Open call for travel grants (max 4-5000 euro) for supporting networking between partners and/or other relevant actors in the region. Due Date: 30.11. 2026</p>	<p>2025-01-01 2027-12-30</p>	<p>- 1</p>

Aktivitet	Beskrivning	Startdatum - Slutdatum	Kostnad
	<p>Deliverable (D1.1): Narrative of Expert Visits</p> <p>Description: This document compiles the reports and descriptions of expert visits, company visits, and visiting experts made during the project. It will be published in the project's website.</p> <p>Due Date: 30.09. 2027</p>		
WP2 Exploring the value chains regarding spruce needle procurement in Sweden	<p>SLU Umeå will coordinate this work package, focusing on optimizing the use of spruce needles as a bio-based raw material for industrial applications. SLU Umeå is specialized in preparing bio-based feedstocks through various mechanical and thermal processes, including comminution, drying, grinding, fractionating, and compacting. The pilot plant at SLU's Biomass Technology Centre (BTC) will produce specific needle fractions tailored for chemical extraction at both laboratory and pilot scales, in collaboration with Centria. The primary objective is to adjust the material properties to enhance the efficiency and quality of extraction processes, ultimately improving yield and optimizing the entire value chain related to spruce needle procurement and industrial refining.</p>	2025-01-01 - 2027-12-30	
2.1 - Preparation of Spruce Needle Biomass for Extracting Valuable Compounds	<p>This task centers on preparing spruce needle biomass to optimize it for extracting valuable compounds. The process involves several key steps to refine the raw material for subsequent extraction processes:</p> <ul style="list-style-type: none"> - Harvesting and Collection: Spruce needles are carefully collected to ensure high-quality biomass, minimizing contamination or degradation. - Initial Processing: The needles undergo size reduction (comminution), breaking them into smaller, manageable fractions to increase surface area and improve extraction efficiency. - Fractionating and Sorting: The biomass is fractionated and sorted by size and other physical properties to create optimal batches for extraction. This step ensures that only the most suitable fractions are used, maximizing extraction efficiency and quality. - Freezing and Stabilization: The biomass is frozen to preserve its stability during storage and subsequent processing. <p>These preparatory steps ensure the spruce needle biomass is ready for chemical extraction, where valuable compounds such as essential oils, antioxidants, waxes, and other bioactive ingredients will be isolated. The aim is to produce high-quality feedstock, enhancing yield and purity, and contributing to the success of the value chain for industrial applications.</p> <p>Deliverables:</p> <p>D2.1: Delivery of smaller samples of pre-treated spruce needles to Centria for laboratory scale extractions.</p> <p>D2.2: Delivery of first batch (not optimized process) of spruce needles for pilot scale extraction to Centria.</p> <p>D2.3: Delivery of second batch (optimized process) of spruce needles for pilot scale extraction to Centria.</p> <p>Milestone:</p> <p>M2.1: The initial processing, fractionation and sorting is fully optimized for wax extraction from spruce needles.</p>	2025-01-01 - 2027-12-30	1 126 519
2.2 - Quality Control of Processed Spruce	<p>This task is focused on ensuring the quality of the produced biomass fractions through chemical analysis and Near-Infrared</p>	2025-01-01 - 2027-12-30	794 290

Aktivitet	Beskrivning	Startdatum - Slutdatum	Kostnad
Needle Biomass	<p>Spectroscopy (NIR). The aim is to develop a fast, non-destructive tool for accurate quality assessment of the material.</p> <ul style="list-style-type: none"> - Chemical Analysis: The total amount of extractives in the spruce needle fractions will be determined using an acetone/petroleum ether solvent system. This method efficiently dissolves a wide range of hydrophobic and moderately polar compounds, such as essential oils, lipids, and other bioactive substances. Additionally, moisture content and ash content will be measured to assess the overall quality of the biomass fractions. - Near-Infrared Spectroscopy (NIR): NIR is employed as a non-destructive and rapid analytical technique to monitor key parameters like chemical composition, moisture content, and structural characteristics of the processed biomass. - NIR Calibration Models for Extractives, Ash, and Moisture: Calibration models will be developed using multivariate data analysis to enable NIR to accurately quantify the total amount of extractives, as well as the ash and moisture content of the spruce needle fractions. This will enhance the precision and reliability of the quality control process. <p>Deliverables: D2.4: Preliminary NIR calibration model for extractives, ash and moisture in pre-processed spruce needles. D2.5: Fully developed NIR calibration model for extractives, ash and moisture in pre-processed spruce needles. Milestone: M2.2: A robust useful NIR calibration model for quality control (extractives, ash and moisture) of pre-processed spruce needles.</p>		
2.3 - Techno-Economic Evaluation (and Life Cycle assessment) of the Process from Harvesting to Chemical Extraction	<p>The techno-economic evaluation (TEE) examines the technical feasibility and economic viability of the entire spruce needle procurement and extraction process. This evaluation is essential for determining the cost-effectiveness and scalability of the process for industrial applications. Key components of the TEE include:</p> <ul style="list-style-type: none"> Harvesting and Collection Initial Processing (Comminution, Fractionation) Transportation and Logistics Chemical Extraction of Waxes and Other Compounds Profitability Analysis Sensitivity Analysis <p>The techno-economic evaluation identifies key cost drivers and technical challenges along the value chain, from spruce needle harvesting to chemical extraction. A successful process requires optimizing each step for cost efficiency, technical performance, and product quality, ensuring the process is economically viable and scalable. Aligning technical feasibility with market demand will maximize profitability and ensure long-term sustainability. In addition, if the economic evaluation looks promising, a life cycle assessment of the process from harvesting to chemical extraction of waxes will be made.</p> <p>Deliverables: D2.6: A description of the current market situation (market supply and demand) for forest residues in the Aurora Botnia area from forest industrial facilities and from the heating and electricity-producing sector. Due date:</p>	2025-01-01 - 2027-12-30	794 290

Aktivitet	Beskrivning	Startdatum Slutdatum	- Kostnad
	<p>D2.7: Report on the techno-economic evaluation from spruce needle harvest to extraction Including the above describe key components.</p> <p>D2.8: Analysis of how the flows of the material can change if new facilities are established and find the optimal positions for their establishment (lowest cost of acquisition).</p> <p>D2.9: Life cycle assessment (LCA) of the process from harvesting to chemical extraction of waxes.</p> <p>Milestones: M2.3: TEE (and LCA) for identification of key cost drivers and technical challenges along the value chain, from spruce needle harvesting to chemical extraction.</p>		
<p>WP3 Exploiting forest side streams as source material for extraction of waxes and bioactive substances</p>	<p>Centria Kokkola will be the coordinator of this WP. The Nordic region has interesting candidates of raw material for wax production. One of the most prominent is conifers as their needles are a high-volume waste source with a high amount of wax on their surface. Conifers have been used to produce wood and cellulose based products, however needles, which are a byproduct of industrial process, remains source for waxes.</p> <p>The objective is to optimize the extraction of waxes from logging residues and berries in lab scale and pilot scale. Waxes as intermediate products are crucial for developing biosensor applications by UOulu. Waxes are used as building materials in Molecularly imprinted polymers (MIPs) production that can capture extracellular vesicles (EV) for biomonitoring.</p> <p>A literature review will be carried out in order to check the current status of liquid extraction and other promising technologies which would be most potential for upscaling to industrial scale.</p> <p>The production process for obtaining waxes from biomass typically involves several distinct stages: pre-treatment, extraction, downstream processing, and solvent recovery, if organic solvents are used. The pre-treatment phase involves reducing the size of the biomass through cutting and grinding. It can also include drying of raw material to improve storage life.</p>	<p>2025-01-01 - 2027-12-30</p>	
<p>3.1 - To perform extractions from spruce needles delivered by SLU</p>	<p>To perform extractions from spruce needles delivered by SLU. These extracts would be further studied in defined preclinical tests for functioning as antimicrobial, antioxidant, cytotoxicity compounds as well as for sun protection factors. Considerable amount of work has been done previously on pine bark extracts with already established pharmaceutical products like Pycnogenol® (PYC) and Flavangenol® from French Maritime Pine.</p> <p>Based on the survey results testing and optimization of the extraction process of spruce needles is started with an ASE-equipment (accelerated solvent extraction). Process parameters to be optimized include e.g. temperature, time, solvent ratio. Process parameters are varied according to an experimental design planning tool MODDE. Process parameters which give the highest yield of waxes will be selected for further testing in a five-liter reactor and later in reactors between 10-20 liters.</p> <p>Waxes from berries will also be extracted for further testing at University of Oulu.</p> <p>The aim is to develop liquid extraction processes which can be</p>	<p>2025-01-01 - 2027-12-30</p>	<p>1</p>

Aktivitet	Beskrivning	Startdatum - Slutdatum	Kostnad
	<p>tested by enterprises in their industrial extraction manufacturing. We will work closely with our target enterprise Innomst in order to optimize feasible industrial extraction processes. Extracted waxes are so called intermediate products which can be utilized by final product manufacturing enterprises. The extracted waxes will be evaporated to various concentrations which will be tested by U of Oulu in order to find to most suitable concentration for developing biosensor applications.</p> <p>Milestones: M3.2. An optimized lab scale liquid extraction method for waxes Date: 31.12.25 M3.3. An optimized pilot scale liquid extraction method for waxes Date: 30.9.27</p> <p>Deliverables: D3.1. Literature review report on liquid extraction of waxes Date: 31.12.25 D3.2. A report on optimized lab scale extraction methods for waxes Date: 31.12.25 D3.3. A report on optimized pilot scale extraction methods for waxes Date: 30.11.27</p>		
<p>3.2 - To study the chemical composition of waxes from pine and spruce needles</p>	<p>The composition of wax varies with the plant species as well as developmental stage. Therefore, it is important to study the chemical composition of wax from distinct species to screen the most important ones for further investigations. In the previous WAX project, Oulu University have studied wax composition of bilberry, lingonberry, crowberry and bogbilberry. However, there exists a myriad of sources in Finnish forests, such as pine and spruce needles to be further studied for wax for specific properties.</p> <p>Extracted waxes are characterized for the typical chemical compounds by e.g. LC and GC-MS, UV methods.</p> <p>Milestone: M3.3. Characterization of chemical compounds in waxes Due date: 30.9.2027</p> <p>Deliverable: D3.4. A report on characterization results Due date: 30.11.2027</p>	<p>2025-01-01 - 2027-12-30</p>	<p>1</p>
<p>WP4 Development of plant wax- and EV-based biosensor platforms for capture and monitoring human EVs</p>	<p>This work package focuses on the development and optimization of biosensor platforms that leverage plant waxes and extracellular vesicles (EVs) to capture human EVs, particularly those derived from sweat. The work will begin with the isolation and detailed characterization of plant-derived EVs from sources such as spruce and Nordic berries. We will develop targeted matrices using plant waxes and isolated plant EVs to create recognition sites. This process will involve selecting appropriate functional monomers and cross-linkers, polymerization techniques, and subsequently removing the EV templates to reveal binding cavities tailored to the molecular features of the EVs. To evaluate the binding affinity and specificity of the</p>	<p>2025-01-01 - 2027-10-30</p>	

Aktivitet	Beskrivning	Startdatum - Slutdatum	Kostnad
	<p>developed biosensor platforms, in vitro assays will be conducted using isolated plant and human EVs. These assays will include binding tests, along with enhanced surface adherence. The EVs will be quantified and characterized to assess the efficacy of the biosensor platforms. By integrating these components, WP4 aims to produce a useful biosensor platform that will serve to advance the diagnostic and therapeutic applications in biomedicine while promoting sustainable development in the bioeconomy.</p>		
4.1 - Production and characterization of plant EVs	<p>This activity will focus on the isolation and detailed characterization of EVs from plants, specifically spruce and Nordic berries, with an additional goal of exploring large-scale production opportunity. EVs will be isolated through differential ultracentrifugation (DUC), as used method for isolating vesicles. After isolation, the physical and molecular properties of the EVs will be analyzed using the following techniques:</p> <ul style="list-style-type: none"> - Protein and lipid quantification: Protein content will be measured using Qubit protein assays, while lipid composition will be analyzed using sulphophosphovanillin assays to quantify the respective concentrations within the isolated EVs. - SDS-PAGE protein profiling: The EV protein profile will be assessed by SDS-PAGE to identify and characterize the diversity of proteins present within the vesicles. - Particle size distribution, particle concentration, and zeta potential of isolated EVs will be determined by Nanoparticle Tracking Analysis (NTA) or Dynamic Light Scattering (DLS). - Density of EVs will be determined by density gradient ultracentrifugation. - The structural integrity and morphology of the EVs will be visualized using electron microscopy, ensuring that the vesicles retain their natural form. - Vesicular molecular cargo analysis (Omics studies) will be conducted via mass spectrometry, to reveal their potential bioactive components. - In vitro characterization: The bioactivity and safety of the plant EVs in human cells will be evaluated through in vitro assays (cytotoxicity, cell proliferation, etc). <p>Milestone: M4.1. Completion of EV isolation and characterization Description: Achieving the successful isolation and detailed characterization of plant-derived EVs from selected sources. Due date: 30.09.2025</p> <p>Deliverable: D4.1. Characterization report of plant-derived EVs Description: A comprehensive report detailing the isolation and characterization of EVs from spruce and Nordic berries. Due date: 30.09.2025</p>	2025-01-01 - 2027-10-30	1
4.2 - Development of matrices from plant waxes and EVs for biosensors	<p>This activity will focus on the step-by-step development of matrices using plant waxes that obtained from WP3 (e.g., Arctic berry and spruce needle waxes) and EVs to create a robust biosensor platform. The process involves:</p> <ul style="list-style-type: none"> - Template selection: Waxes from Arctic berries and spruce needles will serve as the matrix material, and EVs will be used as templates for such matrix. The goal is to use the waxes as features of EV binding, based on EV lipid or surface protein properties. 	2025-01-01 - 2027-10-30	1

Aktivitet	Beskrivning	Startdatum - Slutdatum	Kostnad
	<ul style="list-style-type: none"> - Monomer selection: Functional monomers compatible with both the hydrophobic nature of waxes and the biomolecular components of EVs will be monitored. These monomers may have complementary chemical groups to interact with the target molecules during berry/needle plant wax EV interactions. - Cross-linker selection: Cross-linkers will be tested in aims to stabilize the wax network to enhance plant EV binding, promoting specific structural integrity during plant wax based use in EV binding for biosensor applications - Polymerization: Polymerization techniques such as bulk polymerization, surface polymerization, or precipitation polymerization will be used for value building for the plant waxes as EV measures. - Template removal: In wax-based systems, solvents or heating will dissolve and remove the wax to leave the EV binding sites, while in the EV-based systems, washing or detergent treatments will eliminate the EVs bound. <p>Milestone: M4.2. Finalization of polymer matrix development Description: Completion of the development and optimization of plant wax matrices, including the protocols for wax linking and template removal. Due date: 31.12.2026</p> <p>Deliverable: D4.2. Optimized protocols for wax based matrix development Description: Documented protocols for the development of wax based matrices from purified plant waxes and EVs, covering template selection, monomer and cross-linker selection, linking techniques, and template removal methods. Due date: 31.12.2026</p>		
4.3 - Evaluation of binding affinity of plant waxes and targeted polymer matrices to human EVs	<p>This activity will focus on testing the binding interactions between plant waxes and targeted polymer matrices developed in Activity 2 and human EVs (e.g. sweat-derived EVs), through in vitro assays. The objective is to assess the effectiveness and selectivity of the binding mechanisms in a controlled environment. The process will involve the following steps:</p> <ul style="list-style-type: none"> - Preparation of human EVs: Sweat-derived EVs will be isolated from human sweat samples using DUC, following a standardized protocol. - Coating and functionalization: Plant waxes and targeted polymer matrices will be coated or functionalized with specific ligands, antibodies, or biomolecules to enhance their binding capacity for human EVs. - In vitro binding assays: The binding affinity of plant waxes and polymer matrices to human EVs will be evaluated through static and dynamic binding assays. - Quantification of binding: The bound EVs will be quantified using techniques such as fluorescence or enzyme-linked immunosorbent assay (ELISA). - Characterization of bound EVs: The characteristics of the bound sweat-derived EVs will be analyzed post-binding using techniques such as NTA, MS. <p>Milestone: M4.3. Completion of In vitro binding assays Description: Finalizing the evaluation of binding interactions</p>	2025-01-01 - 2027-10-30	1

Aktivitet	Beskrivning	Startdatum - Slutdatum	Kostnad
	<p>between the biosensor platforms and human EVs, with all data analyzed and reports prepared for dissemination. Due date: 31.10.2027</p> <p>Deliverable: D4.3. In Vitro binding assay results Description: A report summarizing the findings from in vitro binding assays that evaluate the binding affinity and specificity of the developed biosensor platforms to human EVs. Due date: 31.11.2027</p>		
<p>WP5 Business potentiality - From side streams to business</p>	<p>This work package is led by the Lead partner and all partners take part. The aim of this work package is to clarify the working environment of the subject and to make more detailed analyses of the market potential of the field, especially in the biosensor business.</p> <p>Another goal of the work package is to form a cross-border interaction platform with researchers and business representatives. This is promoted by the Innovation and Interaction Board, which is established and meets several times during the project. Business destinations are also visited.</p> <p>Biosensors are analytical devices that combine a biological component (such as an enzyme, antibody, or nucleic acid) with a physicochemical detector to measure the presence of chemicals, biological molecules, or pathogens. Biosensors can use natural biological elements as the recognition element. The Technology Readiness Level (TRL) of biosensors can vary widely depending on the specific type and application. Generally, biosensors can be found at different stages of development, from early research (TRL 1-3) to more advanced stages ie. ready for commercial deployment (TRL 8-9). Many biosensors used in medical diagnostics or environmental monitoring are often in the mid-range of TRLs (4-6), where they are undergoing validation and testing in relevant environments. Some advanced biosensors, particularly those integrated into commercial products, might reach TRLs 7-9, indicating they are near or at full commercial readiness.</p> <p>The aim is to use the waxes also (list to be verified in Innovation and Interaction Board meetings):</p> <ul style="list-style-type: none"> - Drivers of liquid dynamics on basic lateral flow assays - these waxes can go directly to such production as products. - The waxes as themselves as printed intelligence sensors. <p>The Project Coordinator / Leader will use 20% and Lead partner's specialist 5% of their working hours to this WP. The acquisition of expert services for business analysts will be also done here.</p>	<p>2025-03-03 - 2027-08-30</p>	
<p>5.1 - Potential use of waxes in biosensor technology</p>	<p>Round table discussions (face-to-face, and web-based), business expert services and a concluding report.</p> <p>Milestones: M5.1. Waxes meeting, year 2025 Due Date: 31.8. 2025</p> <p>M5.2. Waxes meeting, year 2026 Due Date: 30.11. 2026</p>	<p>2025-03-03 - 2027-08-30</p>	<p>1</p>

Aktivitet	Beskrivning	Startdatum Slutdatum	-	Kostnad
	Deliverables: D5.1. Expert work report Due Date: 31.1. 2027			
5.2 - Potentiality of Extracellular Vesicles (EVs) as superfood	Round table discussions (face-to-face, and web-based), business expert services and a concluding report. Milestones: M5.3. EVs meeting, year 2026 Due Date: 31.8. 2026 M5.4. EVs meeting, year 2027 Due Date: 31.8. 2027 Deliverables: D5.2. Concluding report Due Date: 31.8. 2027	2025-03-03 2027-08-30	-	1
5.3 - Innovation and Interaction Board (IIB)	All the companies that have expressed interest, as well as those with which connections will be built later, are invited to facilitated events where information is exchanged mutually. The project presents its goals, activities, operational environment, and results. Various business opportunities are considered with the help of experts, and visits to companies and development environments are organized, along with joint familiarization with different infrastructures. Four (4) Board meetings (face-to-face) and several visits to biotech and printed intelligence/sensor technology companies in the region. Milestones: M5.5. Innovation and Interaction Board meeting I Oulu area Due date 30.4. 2025 M5.6. Innovation and Interaction Board meeting II Umeå area Due date 31.12. 2025 M5.7. Innovation and Interaction Board meeting III Kokkola area Due date 31.5. 2026 M5.8. Innovation and Interaction Board Meeting IV Oulu area Due date 31.8. 2027	2025-03-03 2027-08-30	-	1
W6 Communication and dissemination	UOulu is responsible for the dissemination and communication in the Interreg Aurora project. Cross-border dissemination activities will aim to make visible the contents and research results of the project to both scientific and non-specialist audiences. Effective dissemination, both external and internal communication together of findings are central to successful high-impact research, whenever the project involves multiple groups of academic and non-academic partners and audiences. This work package is a crosscutting work package thus coordinating communication activities with all the other work packages. The Project leader and specialist at UOulu will both use 10% working time to this work package. Dissemination, communication, and exploitation activities	2025-02-02 2027-11-29	-	

Aktivitet	Beskrivning	Startdatum - Slutdatum	Kostnad
	<p>pursue five main objectives, namely to:</p> <ol style="list-style-type: none"> 1. Improve consumer and company awareness and public visibility of new raw materials, i.e., natural waxes. 2. Increase interest, understanding and appreciation of the public in natural resources and sustainable growth. 3. Inform the research community and other relevant stakeholders of the research findings. 4. Influence media and other audiences positively. 5. Provide accurate, efficient, and real-time internal and external communication. 		
6.1 - Project website, appropriate social media channels & communication plan	<p>As the central communication tool, the aim of the website is to improve dissemination and provide online access to project's progress and results. In addition, the website will contain information about project partners, latest developments in research, workshops and conferences. For social network interaction, LinkedIn, Facebook, YouTube, and blogs will also be utilized to contribute to the dissemination objectives.</p> <p>A more detailed internal and external dissemination and communication plan will be drafted at the beginning of the project including communications objectives, internal and external target groups, key messages, main communication channels/tools and assessment of communication.</p> <p>Milestone: M6.1. Project website Description: A WordPress-based website on a commercial server so that all project partners can update it. The main user is the project manager. Due Date: 31.5.2025</p>	2025-02-02 - 2027-11-29	1
6.2 - Newspaper articles and presentations	<p>Articles will be published in local newspapers in Finland and Sweden as well as project presentations will be given in various events.</p> <p>Deliverables: D6.2. Newspaper article about Waves-project Due date: 31.10.2025</p> <p>D6.3. Newspaper article about Waves-project's outcomes Due date: 31.10.2027</p>	2025-02-02 - 2027-11-29	1
6.4 - Opening and closing events	<p>The project kick-off will be organised in Oulu at the start of the project.</p> <p>The project outcomes and results will be presented in a two-day closing event. The first day of the closing event will be focused on networking and business development workshops. The second day will be organized especially for the project target group including for example key-note speakers, success stories and a panel discussion on what kind of business and networks have emerged during the project.</p> <p>Milestone: M6.2. Closing conference Due Date: 15.11. 2027</p>	2025-02-02 - 2027-11-29	1

Budget (Kostnads- och finansieringsplan)

Kostnad

Kostnadsslag	2025	2026	2027								Totalt
Personal	829 791	770 366	829 791								2 429 948
Schablonkostnader	331 916	308 146	331 916								971 978
Summa kostnader	1 161 707	1 078 512	1 161 707								3 401 926
Projektintäkter											
Summa faktiska kostnader	1 161 707	1 078 512	1 161 707								3 401 926
Bidrag i annat än pengar											
Summa bidrag i annat än pengar											0
Summa totala kostnader	1 161 707	1 078 512	1 161 707								3 401 926

Finansiering

Finansiär	2025	2026	2027								Totalt
Offentligt bidrag i annat än pengar											
Totalt offentligt bidrag annat än pengar											0
Offentlig kontantfinansiering											
LÄNSSTYRELSEN I NORRBOTTENS LÄN	755 109	701 033	755 109								2 211 251
Total offentlig kontantfinansiering	755 109	701 033	755 109								2 211 251
Total offentlig finansiering	755 109	701 033	755 109								2 211 251
Privata bidrag i annat än pengar											
Totalt privat bidrag annat än pengar											0
Privat kontantfinansiering											
Totalt privat kontantfinansiering											0
Totalt privat finansiering											0

Stöd

Finansiering	2025	2026	2027								Totalt
19.1.1 Regionala utvecklingsåtgärder Regionalt projekt	406 598	377 479	406 598								1 190 675

Sammanställning (Stödprocent)

Stödandel av faktiska kostnader:	35,00 %
Stödandel av stödgrundande finansiering:	35,00 %
Stödandel av total finansiering:	35,00 %
Andel annan offentlig finansiering:	65,00 %
Andel privat finansiering:	0,00 %

Rapportering och begäran om utbetalning

Stödet utbetalas i efterhand efter redovisning av faktiska utgifter
AoU synkas med Interreg Aurora.

Sista datum för slutrapport

2028-02-29

Allmänna villkor för stöd

Se bilaga

Särskilda villkor

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Beslut i detta ärende har fattats av Patrik Sällström, Regional utvecklingsdirektör efter
föredragning av Mayuri Kumari.

Vid frågor kontakta:

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