Liste des prototypes créés avec documentations associées lors de l'expérience Citeuropass, par les 55 participants

Projet 1.1 Green rooftop module

ProjectMembers:PeterVeselovský,PondchanokPiraintorn,VladFaranoel

ProjectOverview

Thisprojectaimstodevelopsustainablegreenrooftopmodelsusingwoodasaprimary material, incorporating environmentally friendly design principles to enhance urban biodiversityandmitigatetheurbanheatislandeffect.

Frugal Technology Approach

Introduction:

In pursuit of environmentally conscious urban development, this project strategically employs frugal technology to achieve its goals in implementing green rooftop models constructed primarily from wood. By leveraging cost-effective and resource-efficient technologies, the initiative aims to maximize sustainability while minimizing the ecological footprint, contributing to the advancement of greener urban landscapes.

Conclusion:

The utilization of frugal technology has been pivotal in realizing the objectives of this project, ensuring that the implementation of wood-based green rooftop models remains both economically viable and environmentally sustainable. The integration of innovative yet cost-effective solutions underscore the project's commitment to fostering resilient and eco-friendly urban ecosystems.

References:

Fig. 1.1 Green rooftop module idea

Project Image

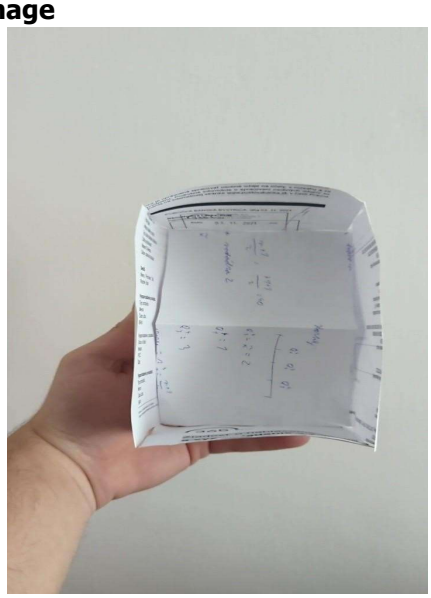


Fig. 1.2 Initially paper prototype

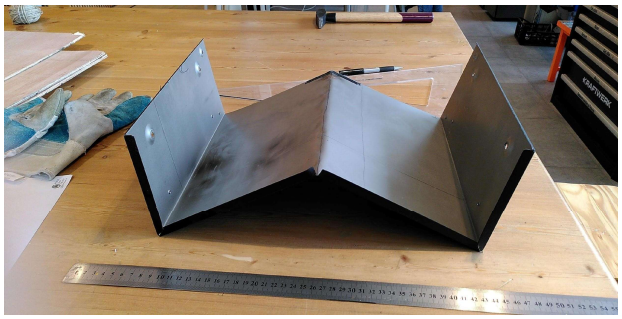
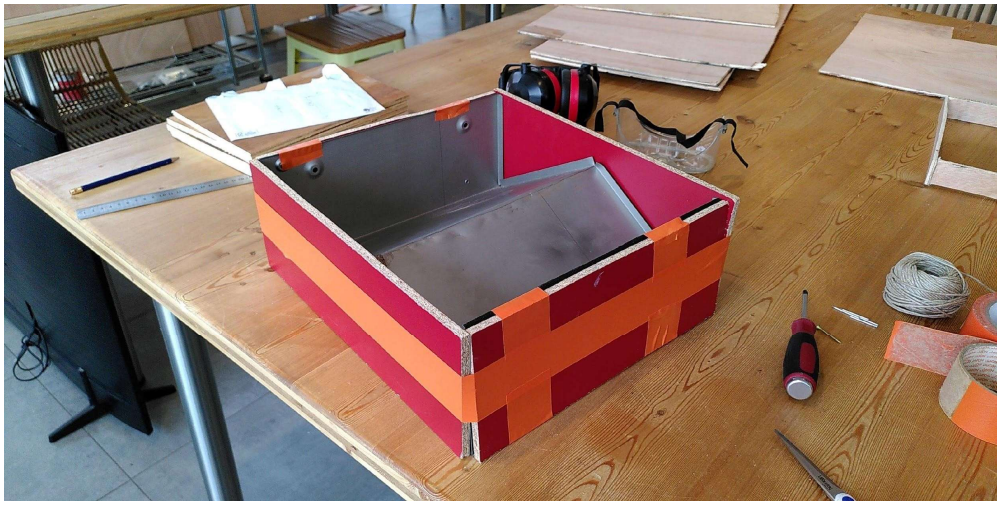


Fig. 1.3 Some materials for prototype



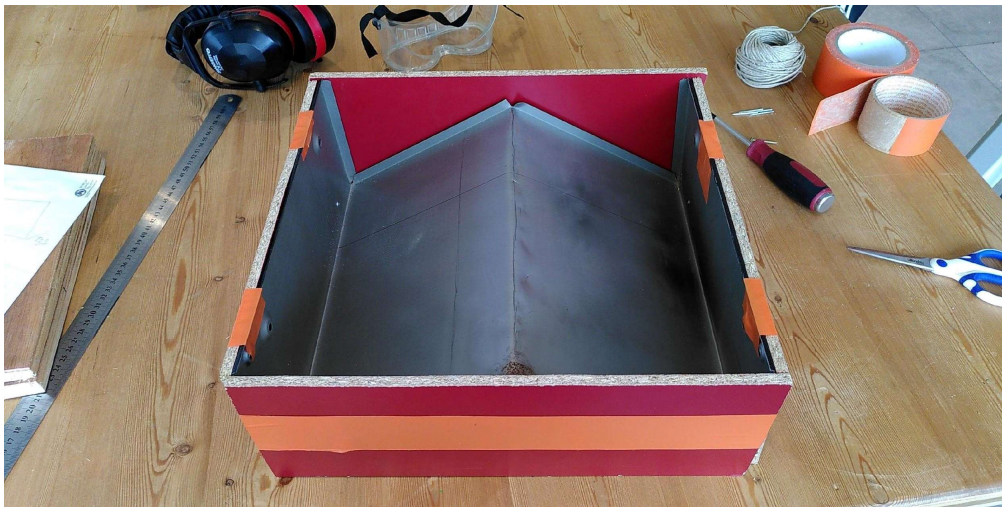
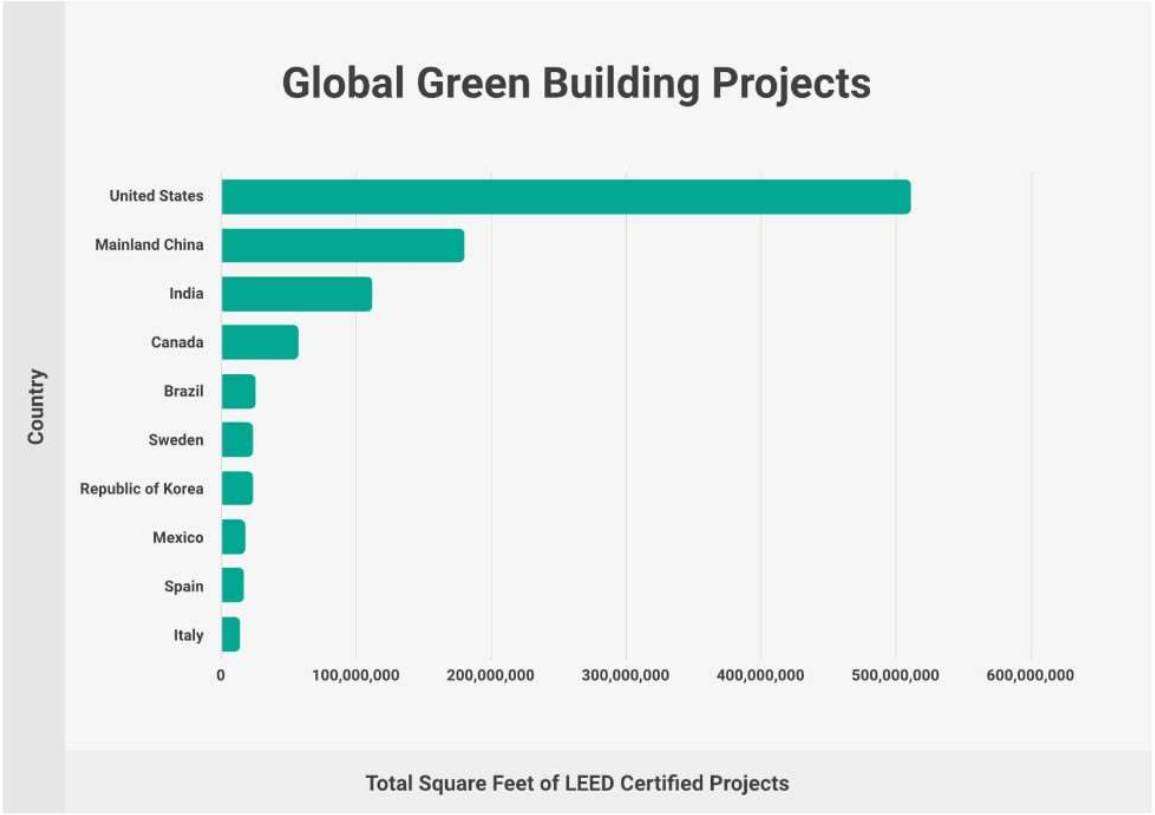


Fig. 1.4 The prototype green rooftop module World need for green projects



Source: RubyHome 2023 (Green Building Statistics (2023) (rubyhome.com))

Biotechnology Application

Biotechnology improves green rooftop sustainability by using biodegradable materials and advanced bioengineering for resilient, eco-friendly plant substrates enriched with beneficial microorganisms. It enhances plant tolerance to rooftop stressors, such as drought and temperature fluctuations, through genetic modification. Additionally, biotechnology optimizes water use, reducing irrigation needs and promoting sustainable water practices, ultimately enhancing the ecological performance, durability, and adaptability of green rooftop modules for sustainable urban development.

Ecological Impact

Green rooftop modules are a key asset in urban ecology, providing solutions to challenges posed by urbanization. This overview delves into their ecological impacts, emphasizing their role in

fostering biodiversity, alleviating the urban heat island effect, enhancing air quality, and managing stormwater runoff.

Green rooftops excel in promoting urban biodiversity, creating habitats for various species. They also combat the urban heat island effect by reducing surface temperatures, improving overall urban climate resilience. Additionally, these modules act as natural air purifiers, capturing pollutants and dust particles, and contribute to sustainable water practices by managing stormwater runoff.

In summary, green rooftop modules emerge as a comprehensive solution for promoting ecological balance in urban areas. Their contributions to biodiversity, climate regulation, air quality, and water management make them integral for sustainable urban development.

Open-Source Contribution

Our open-source green rooftop module is a do-it-yourself (DIY) solution designed to empower individuals and communities to create sustainable urban green spaces. The module is compact, lightweight, and easy to assemble, making it accessible for both gardening enthusiasts and those new to green roofing.

Future Company Potential

In the evolving landscape of urban sustainability, a pioneering company specializing in DIY green rooftop modules stands at the forefront of transformative possibilities. This venture envisions a future where individuals, from homeowners to community organizations, can seamlessly contribute to environmental conservation and elevate the aesthetic and functional value of their properties.

The market potential for DIY green rooftop modules is robust, driven by a burgeoning demand for accessible and affordable solutions. The modular design not only ensures affordability but also allows users to customize their green rooftops, catering to diverse urban environments and individual preferences.

Key features, including educational initiatives and tech integration for smart monitoring, position the company as an influential player in the urban sustainability sector. By fostering a culture of learning and collaboration, the company not only contributes to green infrastructure but also promotes environmental education.

The environmental impact of DIY green rooftop modules is substantial, addressing the urban heat island effect, enhancing air quality, and fostering biodiversity. As individuals adopt these modules, the cumulative effect on the urban ecosystem is poised to be transformative.

Recommended sources

- Green Roof Systems - Green Roof Outfitters
- M-Tray® Modular Green Roofs - Wallbarn
- https://www.calgary.ca/content/dam/www/uep/water/documents/water-documents/development-approvals-documents/2019/module-three-green-roofs.pdf

Projet 1.2 Lichen Based Screen

ProjectMembers:KučeríkBranislav,StoimenovaHristijana,BuyoyaJeanPierre,BulatCristina Ionela

ProjectOverview

An interactive screen that changes color in response to the quality of the surrounding air, leveraging the unique properties of lichens.

Ecological Transition: Encourages community awareness and proactive behaviors towards cleaner air, aligning with ecological transition goals.

Biotechnology Integration: Incorporates biotechnology by using lichens as living bioindicators to assess and respond to air quality.

Introduction

In the pursuit of sustainable and innovative solutions for environmental monitoring, the integration of lichen-based screens emerges as a novel frontier. Lichens, those resilient symbiotic organisms composed of fungi and algae or cyanobacteria, possess unique properties that make them ideal candidates for advanced biotechnological applications. This groundbreaking approach harnesses the inherent sensitivity of lichens to environmental changes, offering a versatile and cost-effective means of monitoring air and water quality, detecting pollutants, and contributing to ecological conservation efforts.

The lichen-based screen project represents a fusion of biology, technology, and environmental science. By leveraging the symbiotic relationship within lichens, we aim to develop a robust platform capable of providing real-time data on the health of ecosystems, all while adhering to the principles of frugal technology—sustainable, affordable, and accessible.

This initiative goes beyond conventional monitoring methods, introducing a holistic approach that not only assesses environmental conditions but also aligns with broader

goals of sustainability, conservation, and community engagement. With its roots in open-source principles, the project encourages collaboration, knowledge sharing, and the democratization of technology, fostering a global community dedicated to advancing environmental awareness and protection.
As we embark on this journey, the lichen-based screen project promises to redefine the landscape of environmental monitoring, offering a scalable and adaptable solution with implications for various sectors, from local community initiatives to large-scale industrial applications. Through the convergence of nature's resilience and cutting-edge technology, we aspire to contribute to a healthier planet while paving the way for a more sustainable and interconnected future.

Lichen Based Screen

An interactive screen that changes color in response to the quality of the surrounding air, leveraging the unique properties of lichens. This project embodies frugality through the utilization of naturally occurring materials (lichens), minimal electronic components, and open-source principles for scalability and adaptability. Encourages community awareness and proactive behaviors towards cleaner air, aligning with ecological transition goals. Incorporates biotechnology by using lichens as living bioindicators to assess and respond to air quality. The project, while innovative and exciting, presents a potential challenge due to the slow color change expected in lichens, occurring over months rather than days. Primarily aimed at a B2C market, due to its applicability in residential settings and its educational potential in raising awareness about air quality.

Lichens embody a mutualistic partnership between fungi and algae, where the fungus provides shelter, and the algae reciprocate by supplying nourishment. Lacking roots, lichens derive nutrients exclusively from the atmosphere, making them vulnerable to pollutants that can impact their community. Particularly sensitive to atmospheric nitrogen, lichens, such as Usnea, Hypogymnia, and Parmelia, serve as indicators for assessing air pollution. Unlike conventional dehydration, lichens may undergo complete water loss during dry periods.

Certain lichens, integral to nitrogen contribution in soils, achieve this through litter formation or predation by herbivores like snails. In arid zones, lichens contribute to extensive biological soil crusts crucial for maintaining soil structure. The morphology of lichenized thalli varies, categorized as crustose, leprose, foliose, filamentose, and fruticose, each influenced by the phytobiont and its interaction with the mycobiont.

This symbiotic relationship between algae and fungi in lichens extends to applications in the food industry and the prevention or treatment of human diseases, leveraging the production of secondary metabolites for defense. Thriving in inhospitable environments, lichens pioneer diverse habitats, ranging from extreme temperatures to desiccated

landscapes, including ancient environments and arid regions conducive to cryptogamic soil crusts.

In general, three mechanisms have been proposed regarding metal absorption in lichens:

1. Intracellular absorption through an exchange process;
2. Intracellular accumulation
3. Entrapment of particles containing metals.

Consequently, lichens serve as effective bio-accumulators of elements and trace elements, as the concentrations in their thalli directly mirror those in the surrounding environment. Utilizing lichens as bio-monitors involves quantifying the accumulation of trace elements within their structures over time. Globally, studies demonstrate the use of lichens as monitors for metal deposition, both actively and passively.

Project Members

Kučerík Branislav, Stoimenova Hristijana, Buyoya Jean Pierre, Bulat Cristina Ionela

Project Overview

Why lichen–based screen? This is an innovative project involving an interactive screen that changes color based on the surrounding air quality, using lichens as living bioindicators. The project emphasizes frugality by utilizing natural materials, minimal electronics, and open-source principles. It aims to raise community awareness about air quality and encourage proactive behaviors aligned with ecological transition goals. Lichens, known for their sensitivity to pollutants, particularly atmospheric nitrogen, play a key role in this project. The symbiotic relationship between lichens' fungi and algae extends to various applications, including the food industry and disease prevention. However, the slow color change in lichens, occurring over months, poses a challenge. The project targets the residential market and has educational potential in promoting air quality awareness. Additionally, the project discusses lichens' role as bio-accumulators of elements and trace elements, their use as bio-monitors for metal deposition, and concerns about soil quality due to chemical fertilizers and pesticides in agriculture.

Frugal Technology Approach

A frugal technology approach for a lichen-based screen involves developing cost-effective solutions that are simple, sustainable, and suitable for resource-constrained

environments. Here are some strategies for implementing a frugal technology approach in the context of a lichen-based screen:

Use Locally Sourced Materials:

- Low-Cost Substrates: Explore local and readily available materials as substrates for lichen cultivation. This can reduce costs associated with sourcing specialized growth media.

DIY Sensor Development:

- Homemade Sensors: Investigate the feasibility of creating DIY (do-it-yourself) sensors using affordable and widely available components. Open-source hardware platforms like Arduino can be utilized for sensor development.

Low-Cost Sensor Calibration:

- Simple Calibration Methods: Develop straightforward calibration methods for sensors that can be performed using commonly available calibration standards or resources. This reduces the need for expensive calibration equipment.

Reuse and Recycle:

- Equipment and Materials: Emphasize the reuse and recycling of equipment and materials whenever possible. Repurposing existing hardware or using recycled components can significantly cut down on costs.

Open-Source Software:

- Free and Open Tools: Utilize open-source software tools for data analysis, modeling, and visualization. This not only reduces software costs but also allows for collaboration with a broader community.

DIY Data Loggers:

- Low-Cost Data Logging Systems: Build simple, low-cost data logging systems using microcontrollers like Raspberry Pi or Arduino. These systems can be customized to collect data from lichen-based screens in a cost-effective manner.

Community Collaboration:

- Citizen Science Initiatives: Engage local communities in data collection through citizen science initiatives. This not only reduces the need for specialized personnel but also fosters community involvement.

Low-Power Solutions:

- Energy-Efficient Devices: Design lichen-based screens with low-power consumption to reduce the need for expensive energy sources. Solar panels or energy harvesting techniques can be explored for sustainable power.

Frugal Prototyping:

- Rapid Prototyping Techniques: Adopt frugal prototyping approaches, using 3D printing or other low-cost fabrication methods for creating prototypes of lichen-based screens.

DIY Environmental Monitoring Stations:

- Homemade Monitoring Stations: Develop cost-effective, DIY environmental monitoring stations using off-the-shelf components. This can be particularly useful for decentralized monitoring networks.

Local Expertise Utilization:

- Training Local Technicians: Invest in training local technicians or community members to maintain and troubleshoot lichen-based screens. This reduces dependence on external expertise. Low-Bandwidth Communication:
- Efficient Data Transmission: Opt for low-bandwidth communication methods for transmitting data from monitoring stations. This can be crucial in areas with limited internet connectivity.

Frugal Innovation Workshops:

- Community Workshops: Organize frugal innovation workshops to brainstorm and implement cost-effective solutions collaboratively. This can involve local stakeholders and community members.

By adopting a frugal technology approach, the lichen-based screen project can be more sustainable, accessible, and adaptable to diverse settings. This aligns with the principles of frugal innovation, focusing on simplicity, affordability, and inclusivity.

Biotechnology Application

Lichens and air quality Internet of Things (IoT) devices offer distinct yet complementary approaches to environmental monitoring. Lichens hold significant biotechnological importance in air quality detection due to their sensitivity and adaptability, their unique symbiotic relationship between fungi and algae or cyanobacteria makes them valuable bioindicators. Lichens accumulate pollutants over time, providing a historical perspective on air quality. They are cost-effective and non-invasive, requiring minimal infrastructure. Lichens offer ubiquitous and long-term monitoring in diverse environments, including remote areas. This natural, living indicator complements IoT devices, providing a holistic and ecologically sensitive approach to assessing air quality, especially in locations where deploying and maintaining extensive IoT networks may be challenging or impractical. The combination of both approaches offers a comprehensive and nuanced understanding of environmental conditions.

These natural bioindicators accumulate contaminants over time, enabling real-time detection of heavy metals and atmospheric pollutants. Integrating lichen-based screens into environmental assays offers a cost-effective and sustainable solution for assessing air and water quality. The adaptability and resilience of lichens make them ideal candidates for continuous monitoring across diverse ecosystems, providing valuable insights into dynamic interactions between living organisms and their surroundings. This biotechnological approach enhances our understanding of environmental dynamics and contributes to the development of eco-friendly strategies, fostering sustainable practices in environmental management and conservation.

In Europe, where urban and industrial activities contribute to air pollution, lichens offer a natural, cost-effective, and widespread method for air quality assessment. By serving as bioindicators, lichens can alert citizens to potential health risks associated with poor air quality, enabling informed decisions on outdoor activities. Moreover, these screens contribute to early detection of environmental degradation, supporting sustainable practices and policies. The adaptability of lichens makes them applicable in both urban and rural settings, providing a versatile tool for citizens across diverse European landscapes. Ultimately, the use of lichen-based screens empowers European citizens with accessible, real-time information to foster environmental awareness and advocate for healthier living environments.

Ecological Impact

Implementing a lichen-based screen for various biotechnological applications can have both positive and negative ecological impacts. It's crucial to carefully assess these impacts to ensure sustainable and responsible use. Here are some considerations:

Positive Ecological Impacts:

Environmental Monitoring:

- Early Warning System: Lichens can act as bioindicators of environmental health. Using them in screens can provide early warnings of pollution or changes in air and water quality, allowing for timely intervention and mitigation.

Phytoremediation:

- Soil Rehabilitation: Lichens with the ability to accumulate heavy metals can contribute to soil rehabilitation and remediation efforts. This could lead to improved soil quality and support the restoration of ecosystems affected by contamination.

Biosensors:

- Reduced Chemical Dependency: Lichen-based biosensors may reduce the need for chemical-based detection methods, minimizing the use of synthetic chemicals in environmental monitoring and pollution detection.

Conservation Awareness:

- Educational Value: Incorporating lichens into ecological studies and citizen science projects can raise awareness about the importance of biodiversity, ecosystem health, and the impacts of human activities on the environment.

Negative Ecological Impacts:

Collection Pressure:

- Habitat Disturbance: If lichens are harvested for biotechnological applications, habitat disturbance is risky. Overharvesting or improper collection practices can negatively impact lichen populations and their associated ecosystems.

Invasive Species Risk:

- Introduction of Exotic Species: If non-native lichen species are introduced for specific applications, there may be a risk of them becoming invasive and outcompeting native species, disrupting local ecosystems.

Ecosystem Disruption:

- Altering Microenvironments: Introducing lichen-based screens into ecosystems may alter microenvironments and ecological interactions. It's important to understand the potential impacts on other organisms, especially those that may rely on specific lichen species.

Limited Resilience:

- Species Vulnerability: Some lichen species are sensitive to environmental changes. Relying on a limited number of species for biotechnological applications may make these systems vulnerable to fluctuations in climate or other ecological stressors.

Mitigation and Best Practices:

Sustainable Harvesting:

- Regulations and Guidelines: Establish regulations and guidelines for the sustainable collection of lichens, ensuring that harvesting practices do not harm populations or their habitats.

Native Species Emphasis:

- Use of Native Species: Prioritize the use of native lichen species to minimize the risk of introducing invasive species and to support local ecosystems.

Ecosystem Monitoring:

- Long-term Monitoring: Implement long-term monitoring programs to assess the ecological impacts of lichen-based screens and adjust strategies accordingly.

Ethical Considerations:

- Responsible Research: Conduct research ethically, considering the potential impacts on biodiversity, ecosystems, and local communities. Strive for a balance between scientific advancements and environmental conservation.

Public Engagement:

- Community Involvement: Engage local communities, stakeholders, and policymakers in the decision-making process to ensure a comprehensive understanding of potential ecological impacts and to incorporate diverse perspectives.

By adopting these best practices and considering the potential positive and negative ecological impacts, it's possible to develop and implement lichen-based screens responsibly and sustainably.

The project encourages community awareness and proactive behaviors towards cleaner air, aligning with ecological transition goals

Lichens play crucial roles in ecosystems, and their presence or absence can indicate environmental conditions. We could summary 5 crucial points/reasons of impact:

- **Air Quality Monitoring**: Lichens are sensitive to air pollution, and their presence or absence can be indicative of air quality. A lichen-based screen could potentially be used as a bioindicator system for monitoring air pollutants. Lichens are sensitive to air pollution, especially sulfur dioxide and nitrogen compounds. Their health and abundance can be used to monitor air quality in a given area.
- **Urban Greening:** The project could contribute to urban ecological transition. Lichens can thrive in urban environments and help mitigate the urban heat island effect, improve air quality, and provide green spaces for biodiversity.
- **Educational Tool:** A lichen-based screen could serve as an educational tool to raise awareness about environmental issues and the importance of ecological transition. Public engagement and education are key components of fostering sustainable practices.
- **Restoration of Degraded Areas:** Lichens, being pioneer species, could play a role in restoring degraded ecosystems. A lichen-based screen might involve initiatives to reintroduce lichens to areas affected by pollution or habitat degradation, aiding in ecosystem recovery.

- **Promotion of Sustainable Practices:** The use of a lichen-based screen could be associated with sustainable practices and environmentally friendly initiatives. This could include promoting businesses or products that adhere to environmentally responsible standards.

Open-Source Contribution

Engaging in open-source contributions for a lichen-based screen project can foster collaboration, innovation, and the development of a broader community around this technology. Here are some ways to contribute to the open-source community in this context:

Data Sharing:

- Environmental Data: Share environmental data collected through lichen-based screens openly. This can include air quality data, water quality data, and other relevant metrics. Open access to this information can benefit researchers, policymakers, and the public.

Code Repositories:

- Algorithm Development: If there are algorithms or software tools developed for data analysis or modeling in the lichen-based screen project, consider open-sourcing them. Platforms like GitHub can serve as repositories for code, allowing other researchers to use, modify, and contribute to the development.

Sensor Designs:

- Hardware and Sensor Specifications: If the project involves the development of specific sensors or hardware components for lichen-based screens, share the designs and specifications openly. This can encourage the community to improve, adapt, or customize the technology for different applications.

Documentation:

- Technical Documentation: Provide thorough technical documentation for the lichen-based screen project. Clear documentation helps others understand the technology, reproduce experiments, and contribute effectively.

Collaborative Research Platforms:

- Online Platforms: Create or contribute to online collaborative research platforms where researchers and developers can discuss, share findings, and collaborate on lichen-related projects. Platforms like ResearchGate or dedicated forums can facilitate knowledge exchange.

Educational Resources:

- Tutorials and Guides: Develop educational resources, tutorials, and guides that help others understand the principles behind lichen-based screens and how to implement similar projects. Share these resources openly to support knowledge dissemination.

Community Building:

- Forums and Discussion Groups: Establish or participate in forums and discussion groups related to lichen-based screens. Encourage community members to share their experiences, ask questions, and contribute their insights.

Bug Reporting and Issue Tracking:

- Open Issue Tracker: Use platforms like GitHub to maintain an open issue tracker. Encourage users and developers to report bugs, suggest improvements, and discuss issues openly.

Contribute to Existing Projects:

- Join Other Open-Source Projects: Explore existing open-source projects related to environmental monitoring, biosensors, or phytoremediation, and contribute your expertise to enhance those projects.

Hackathons and Competitions:

- Participate and Host Events: Engage with the broader community by participating in hackathons, competitions, or collaborative events. Hosting such events can bring together diverse perspectives and drive innovation. Licensing Considerations:
- Open Licenses: Choose open-source licenses for your contributions, specifying how others can use, modify, and distribute the software or data. This encourages a collaborative and transparent development environment. By actively participating in the open-source community, you can leverage the collective intelligence and creativity of a global network of researchers, developers, and enthusiasts. Open collaboration can lead to faster advancements, increased visibility, and the establishment of a community dedicated to the advancement of lichen-based screen technologies.

Future Company Potential

A company centered around a lichen-based screen could have significant potential in various industries. Here are some potential avenues for the future development of such a company:

Environmental Monitoring Services:

- Air and Water Quality Monitoring: Provide environmental monitoring services using lichen-based screens to assess air and water quality in urban,

industrial, and natural settings. Offer data analytics and reporting to clients, including municipalities, industries, and environmental agencies.

Biosensor Technology:

- Toxicity Detection: Develop and commercialize biosensor technologies based on lichens for detecting specific pollutants or toxins. These sensors could be integrated into various industries, such as manufacturing, agriculture, and wastewater treatment.

Phytoremediation Solutions:

- Soil Rehabilitation Services: Offer phytoremediation solutions using lichens to clean up contaminated soils. This could involve collaborations with environmental consulting firms, construction companies, or governmental agencies dealing with land reclamation.

Bioprospecting and Pharmaceuticals:

- Bioactive Compound Discovery: Explore lichens for novel bioactive compounds with pharmaceutical potential. Develop partnerships with pharmaceutical companies to produce drugs with applications in medicine or cosmetics.

Educational Programs and Citizen Science Initiatives:

- Training and Workshops: Provide educational programs on lichens, biodiversity, and environmental conservation. Engage in citizen science initiatives, collaborating with schools, communities, and environmental organizations.

Green Technology Consulting:

- Sustainable Practices: Offer consulting services to industries seeking sustainable and eco-friendly practices. Advise on the integration of lichen-based screens for pollution monitoring and mitigation.

Research and Development Hub:

- Innovation Center: Establish a research and development hub focused on lichen biology, biotechnology, and ecological applications. Collaborate with academic institutions and other research organizations to stay at the forefront of innovation.

Bioenergy and Agriculture:

- Bioenergy Production: Investigate lichens for their potential in bioenergy production. Develop partnerships with agricultural companies or bioenergy firms for the cultivation of lichens in controlled environments. Corporate Partnerships:
- Collaborations with Industry: Form partnerships with industries interested in sustainable and green technologies. Collaborate on joint projects, leveraging the expertise of both parties.

International Expansion:

- Global Reach: Explore opportunities for international expansion, especially in regions where environmental concerns and regulations are driving demand for innovative solutions.

Technology Licensing:

- Intellectual Property: Consider licensing the technology and intellectual property developed during the lichen-based screen project to other companies interested in incorporating these solutions into their operations.

Community Engagement and Outreach:

- Community Initiatives: Engage in community outreach programs, demonstrating the positive impact of lichen-based technologies on local environments. Build strong relationships with communities to ensure sustainable practices and acceptance.

By combining innovative technology, environmental awareness, and strategic partnerships, a company built around a lichen-based screen could become a pioneer in sustainable solutions, contributing to both environmental conservation and business success.

Conclusion

The Lichen Based Screen project represents a significant step forward in frugal innovation for environmental monitoring. By harnessing the natural sensitivity of lichens to air pollutants, we have created a visually engaging and ecologically sound solution to air quality awareness.

This project embodies the core principles of Citeuropass and Nemeton's mission:

1. Frugal Technology: Utilizing readily available materials and natural processes to create an effective, low-cost monitoring system.
2. Ecological Transition: Promoting environmental awareness and encouraging sustainable practices in urban areas.
3. Biotechnology Application: Demonstrating how living organisms can be used as technology, aligning with the "life as technology" approach.
4. Community Engagement: Creating an accessible tool that allows citizens to visually track air quality in their local environment.
5. Open-Source Contribution: Sharing our findings and methodologies to encourage further innovation and adaptation of this concept.

The Lichen Based Screen not only serves as an air quality indicator but also as an educational tool, raising awareness about the importance of lichens in our ecosystems.

It has the potential to inspire community-led environmental initiatives and inform policy decisions regarding urban air quality.

Looking ahead, this project opens up possibilities for further research and development in areas such as:

- Expanding the range of pollutants that can be detected
- Integrating digital technologies for data collection and analysis
- Scaling up for larger urban installations

As we face growing environmental challenges, projects like the Lichen Based Screen demonstrate how frugal, nature-inspired innovations can play a crucial role in building a more sustainable and environmentally conscious future.

Projet 1.3 Modular Moss Walls

ProjectMembers:

Paul BRESSOT
IULIANA OBREJA
Lidia Amelia Frunza
Atanas Rachkov
Fabian Calagreti

ProjectOverview

Themosswallprojectforecologicaltransitionaimstocreatesustainablegreenspacesby installingmossonwalls,fosteringbiodiversity,improvingairquality,andenhancingaesthetic appeal,contributingtoamoreeco-friendlyandvisuallypleasingenvironment.

Frugal Technology Approach

Our moss wall project is the perfect example of the frugal technology approach since it creatively makes use of the resources at hand to create an environmentally responsible and eye-catching installation. Our design, which embodies the idea of achieving more with less, makes use of wires and moss to transform these unassuming pieces into a gorgeous wall feature that improves aesthetics and encourages biodiversity.

Following the principles of economic innovation, we make the most out of common resources by using inexpensive wires to serve as the base for our moss wall. Via ingenious reuse of these

fundamental elements, we convert an unremarkable wall into a flourishing green area that embodies sustainability via minimalism.

Furthermore, we adhere to a frugal culture that includes material reuse, as demonstrated by the use of pre-existing components in the construction of our moss wall. As materials, we are going to use: 4 pieces of Wood or MDF, sawyers, moss, piler, gloves, wires and plant scissors.

Not only is our moss wall aesthetically pleasing, but it's also easily replicable and approachable. It is simply understandable and doable for a variety of consumers due to its simple design and easy-to-use construction process. In keeping with the frugal innovation attitude, our project invites others to adopt and scale up this ecologically friendly solution by embracing simplicity and inclusion.

Our dedication to the frugal technology approach is in line with the project's overall goals and the larger objectives of sustainable resource management that CitiEuroPass supports. As we use nature as our technology and showcase the strength of inventive ingenuity, we open new avenues for Europe to tackle pressing issues and build a more responsible and sustainable future.

Project Images

Fig 1.1 The structure of the moss wall

Fig 1.2 The structure of wires to attach the moss on the wall part 1

Fig 1.3 The structure of wires to attach the moss on the wall part 2

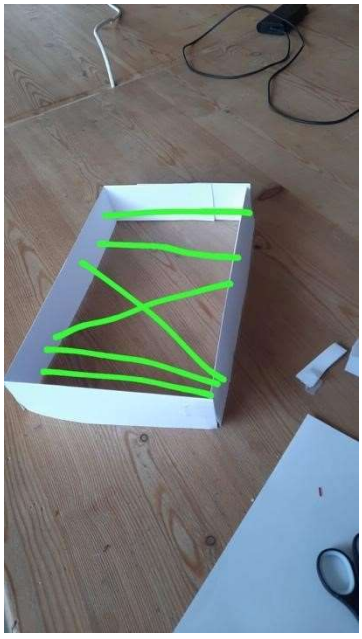


Fig 1.4 The structure of wires to attach the moss on the wall THEPROTOTYPEpart1

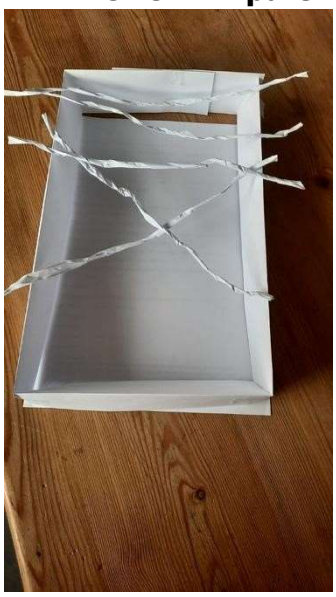


Fig 1.5 The structure of wires to attach the moss on the wall THEPROTOTYPEpart1

Biotechnology Application:

The Modular Moss Walls project integrates biotechnology in innovative ways:

1. Bioindicators: Mosses serve as sensitive bioindicators, offering real-time data on air quality and environmental health. Their ability to absorb and accumulate pollutants makes them excellent natural sensors for monitoring urban environments.
2. Genetic Engineering: Advanced moss biotechnology allows for the genetic modification of moss species, enhancing their air purification capabilities and resilience to urban stressors. This could lead to the development of "super mosses" tailored for specific environmental challenges.
3. Microbiome Engineering: By manipulating the microbiome associated with mosses, we can enhance their ability to break down pollutants and improve air quality. This application opens new avenues for natural air purification systems.
4. Biomimicry: The project draws inspiration from moss's natural water retention and filtration properties, informing the design of sustainable urban water management systems.

Ecological Impact:

The Modular Moss Walls project offers significant ecological benefits:

1. Air Purification: Moss walls act as natural air filters, effectively removing particulate matter, volatile organic compounds (VOCs), and other pollutants from the air. This contributes to improved air quality in urban environments.
2. Biodiversity Support: These walls provide microhabitats for various small organisms, including insects and microorganisms, fostering urban biodiversity even in densely populated areas.
3. Urban Heat Island Mitigation: Moss walls help reduce the urban heat island effect by absorbing heat and increasing humidity, contributing to more comfortable urban microclimates.
4. Noise Reduction: The texture and composition of moss walls can help absorb sound, reducing noise pollution in urban spaces.
5. Stormwater Management: Moss's natural water absorption properties can aid in managing urban runoff, reducing the strain on city drainage systems during heavy rainfall.
6. Carbon Sequestration: Although on a small scale, moss walls contribute to carbon capture, helping to offset urban carbon emissions.

Open-Source Contribution:

The Modular Moss Walls project embraces open-source principles to foster collaboration and innovation:

1. Design Blueprints: We will release detailed design specifications and construction guidelines for the modular moss wall system, allowing others to replicate and improve upon our design.
2. Cultivation Protocols: Moss cultivation techniques and maintenance protocols will be shared openly, enabling communities to grow and care for their own moss walls.

3. Data Sharing Platform: We'll develop an open platform for sharing environmental data collected from moss walls, contributing to broader urban ecology research.
4. DIY Kits and Tutorials: Easy-to-follow tutorials and DIY kit designs will be made available, encouraging widespread adoption and experimentation.
5. Collaborative Research Portal: An online portal will facilitate collaboration between researchers, enthusiasts, and citizen scientists working on moss-related projects.

Future Company Potential:

The Modular Moss Walls project has significant potential for commercial development:

1. Urban Greening Solutions: A company could specialize in designing, installing, and maintaining modular moss walls for cities, businesses, and private residences.
2. Air Quality Monitoring Services: Leveraging the bioindicator properties of moss, the company could offer comprehensive air quality monitoring and reporting services.
3. Biotechnology R&D: Focusing on moss genetic engineering and microbiome manipulation could lead to patentable innovations in air purification and environmental remediation.
4. Sustainable Building Materials: Development of moss-based construction materials could open new markets in the green building sector.
5. Educational Programs: Offering workshops, courses, and consultation services on urban ecology and sustainable design using moss walls.
6. Moss Cultivation and Supply: Becoming a specialized supplier of various moss species for ecological and landscaping projects.
7. Smart City Integration: Developing IoT-enabled moss walls that provide real-time environmental data for smart city applications.
8. Carbon Credit Generation: As regulations evolve, there may be potential to generate carbon credits through large-scale urban moss installations.

Conclusion:

The Modular Moss Walls project exemplifies the innovative spirit of Citeuropass, seamlessly blending nature-based solutions with urban development challenges. By harnessing the natural properties of moss, we've created a multifaceted solution that addresses air quality, biodiversity, and urban aesthetics while embodying the principles of frugal innovation.

This project not only demonstrates the potential of "life as technology" but also showcases the power of cross-disciplinary collaboration among European students. From biotechnology applications to ecological benefits, open-source contributions, and future commercial potential, Modular Moss Walls represent a holistic approach to sustainable urban living.

As we move forward, the insights gained from this project will continue to inform and inspire future innovations in urban greening and environmental management. The Modular Moss Walls

serve as a testament to how simple, nature-inspired solutions can have a profound impact on our cities and quality of life.

By making our research and designs openly accessible, we hope to spark a movement of green innovation across Europe and beyond, encouraging communities to reimagine their urban spaces as living, breathing ecosystems. The future of our cities is green, and projects like Modular Moss Walls are paving the way for a more sustainable, resilient, and biodiverse urban environment.

Projet 2.1 Clear Flow Company



Project Members: Kubilay Berkant Simsek, Martin Martinov, Roberto-Constatine Olaru, Guillaume Dugué, Alexandra-Claudia Andrișoaie, Kristína Rózová, Kiril Vassilev

Date: 18.4.2024

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Project overview: This project aims to develop a sustainable water filtration system using microorganisms to ensure cost-effectiveness and reduce reliance on chemicals and plastic.

1. Company information

We created this company with a clear purpose: to address the need for a sustainable filtration solution. Our journey began with the experience that almost everyone has had: encountering water that had questionable quality at home. In response, people often resort to plastic bottles or water filters for reassurance. But as we looked more closely, we discovered that many conventional water filters primarily consist of plastic. Motivated by the shared goal to nurture not only our bodies but also the environment, we decided to pursue a more sustainable path. To achieve this, we decided to focus on using microorganisms for water filtration – this method offers a lot of benefits including biological purification, sustainability, cost-effectiveness, and reduced reliance on chemicals. We are committed to providing effective, sustainable, and eco-friendly water filtration solutions through which we not only meet today's needs but also safeguard the health of future generations and the planet as a whole.

Name: Clear Flow

- **Clear** = clarity and purity of water,
- **Flow** = the movement and circulation of water through the filtration system.

Product Name: Crystal-clear

2. Product

2.1General idea

How many times have you been very thirsty and when you drink water that should quench your thirst, you feel a strong metallic taste? It is said that home is where the water has no taste. This is how we set out to create our product that can solve this problem in a sustainable and environmentally friendly way. The water filter that uses microorganisms to purify water and eliminate its metallic taste is the perfect solution. With a modern, minimalist design, suitable for any type of kitchen or office, easy to use and effective, ***CrystalClear***, microorganism water filter is the perfect choice for anyone. Hydration is important, but more important is to hydrate with pure water.

2.2Product Description

The product is made of PET-G, which can be considered sustainable for being recyclable (it can be melted down and reprocessed into new products multiple times without significant degradation in quality, reducing the need for virgin materials), durable and by this we are reducing the frequency of replacement and subsequent resource consumption. It also reduces waste through recycling.

The filters are made of cellulose which is also considered to be sustainable and eco-friendly because of its biodegradability, meaning it can be broken down by microorganisms into simpler compounds over time. This property reduces the accumulation of waste in landfills and oceans, unlike non-biodegradable materials like plastics. During their growth, plants absorb carbon dioxide from the atmosphere through photosynthesis to produce cellulose and it can be also very easily recycled.

The water used for the filtration needs to be at room temperature. Using hot water would kill the microorganism and the filtration would not bring the expected results.

Filters

2.3Product price

The price of one kilogram of plastic stands at 58 euros. Estimating the weight of the larger water filter (710x460x120) at 8 kilograms, we multiplied 8 by 58, totalling 464 euros including the price of the filter. However, considering the 19% tax required by Romanian law, the final amount becomes 647,36 euros. To achieve a 20% profit margin, the adjusted price is 776,8 euros. As for the smaller water filter (420x120x215), its price amounts to 404.6 euros. The price for the new filters, which will be reusable will be 60€/4 filters and 100€/ 8 filters.
When setting the price we also considered the labour and manufactured costs.

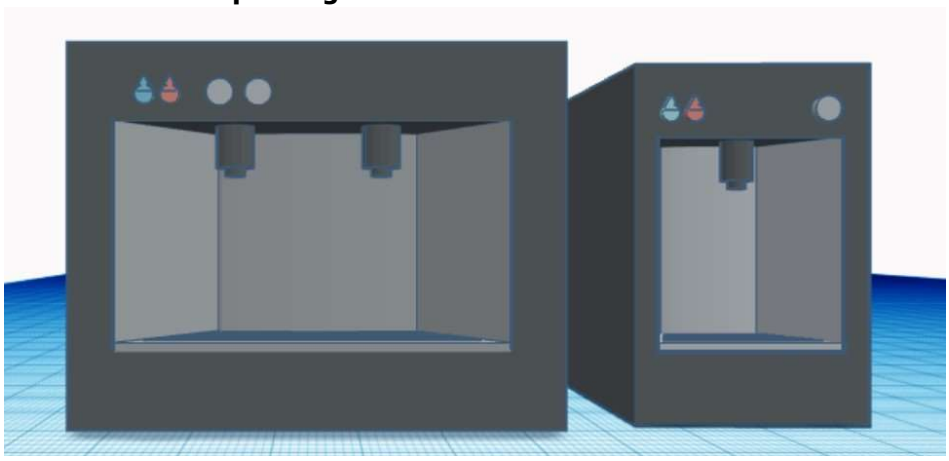
Crystal clear 710x460x120

Crystal clear 420x120x215

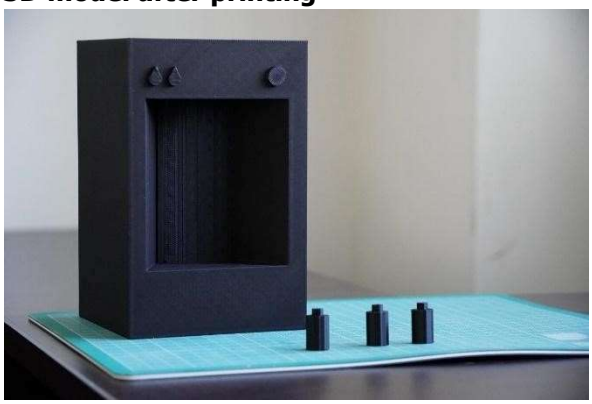
2.4Prototype production

We designed our prototype in Tinkercad and sequentially printed it in a 3D printer.

3D model before printing



3D model after printing



3. Issue that our product solves

The main issue that our product is trying to solve is to provide drinking water that does not have a metallic taste and is not contaminated. In addition, through our product, we try to resume the use of plastic by offering an alternative to drinking safe tap water instead of buying bottled water. We are also trying to reduce the use of regular filters that produce waste because they can not be recycled and also use chemical elements. The production of these filters is more harmful to the planet than the production of microorganism ones.

4. Biotechnology part

In the inner part of the product, there is a filter which has special bacteria in it called Streptomyces. We are cultivating those bacteria ourselves. As a quick recap, taking samples from different soils to decrease the failure possibility of cultivation, and then we heat the samples to 60 degrees Celsius for 30 minutes to kill almost all other undesired bacteria and let them wait in an incubator for 10 days with the agar nutrition for growing mature.

Samples

5. Five aspects of the company

Using more filtered water at the expense of bottled water could help reduce pollution in several ways:

5.1. Sustainability

1) Improving the quality of the water: Ensuring that a wide range of people have access to drinkable water. We need to keep in mind that every drop of water is crucial. We can't miss any source of drinkable water and therefore our product can increase the amount of good-quality water.

2) Reducing plastic waste: Water bottling generates a significant amount of plastic waste, which pollutes the environment and affects aquatic ecosystems. Using a water filtration it could eliminate the need to buy plastic bottles and thus reduce the amount of plastic waste generated.

3) Reducing carbon emissions: The production and transport of bottled water requires higher energy consumption and carbon emissions associated with the manufacture of plastic bottles, bottling of water and its transport to consumers. Using a water filter at home or work can reduce these emissions, as no need for water transport and packaging.

4) Reducing resource consumption: The production of plastic bottles and bottling of water requires the use of resources such as oil or other raw materials and water. Using a water filter can reduce the consumption of these resources.

5) Reducing pollution due to manufacturing: Plastic bottle production and water bottling processes can cause pollution and affect air and water quality. Reducing the demand for bottled water can help reduce this impact on the environment.

5.1. Cost feasibility

The feasibility study is very satisfying. Production costs are not much higher than the production costs of ordinary water filters. Also, maintenance costs are reduced, the product being very durable over time. At the same time, the economy can make using such a filter at the expense of buying bottled water. There are also environmental benefits, the sustainability of our product being optimal. Using this filtration secures the health benefits that result from filtering water with microorganisms and not with filters of any other kind.

5.2. Adaptability

Our system can treat water from various sources and adjust to changing conditions. The system can locate specific contaminants in the water to ensure the purification is optimal. Through this product, we ensure that people have access to safe and clean water.

5.3. Simplicity & Scalability

The product itself requires minimal maintenance and operational complexity. It functions with little human intervention and can be applied at different scales and adjusted to different volumes of water. This system offers a simpler and more accessible approach to water treatment due to reliance on natural processes instead of complex machinery and chemicals. The product itself is very simple which leads to easier installation, operation, and maintenance, making it accessible to a wider range of users, which promotes widespread adoption of sustainable water treatment practices.

6. Ecological Impact

Water filters that use microorganisms, such as bacteria or other living organisms, can help remove contaminants such as viruses, parasites and more from the water. They can be effective in improving water quality for human consumption in areas where drinking water is contaminated with pathogenic microorganisms. Regular water filters such as activated charcoal or membrane filters may require regular replacement of cartridges or membranes, which can generate waste.

The environmental effect of using such a filter is a positive one, reducing waste pollution by 40%. If you want to consume pure spring water with an eco-friendly filter and help reduce waste pollution, our product is the perfect choice.

7. Open-Source Contribution

Testing and Fixing Problems: Get help from testers who will try out our water filter and report any problems they find and change microorganisms occasionally.

Social media: Promoting our product through different social media channels and including influencers.

Sharing Ideas and Tips: Encourage people to share their thoughts and ideas on how to improve our water filter. We can learn from each other and make it even better together. We would have a review section on our website.

8. Our clients

The product will be adjusted to the specific clients.

1. ***Offices*** **-** We want to be as close as possible to our customers, which is why we have chosen to focus on their workplaces. There are several advantages that the offices would benefit

from using our products. For example, it provides a much healthier working environment for their employees, which can increase their efficiency. Secondly, it can reduce the costs of large companies providing plastic water bottles to their employees. Lastly, it would considerably reduce the impact of pollution and reduce the usage of plastic.

2. ***Families -*** In a society that is trying to reduce the amount of plastic in everyday life and educate our children about protecting nature, families are the perfect customers. Parents always want the best for their loved ones in terms of quality and cost. Our products offer both! First of all, it purifies water very successfully thanks to our micro-organisms. And secondly, our product is a real long-term investment, requiring much less maintenance than a conventional water filter.
3. ***School –*** Students and teachers represent a large scale of potential customers to us because they spend a lot of time during the day in the school. Therefore, it is important to secure clean water for them and to show them/teach them how can they reduce plastic waste and adopt eco-friendly practices that would be beneficial for their future. By getting them used to using our product in everyday life, they will be able to talk about it to those around them and in the future they will even be able to buy our range their ones for families. At the beginning of each school year, we want to sell bottles which will reduce usage of the plastic bottles throughout the year and teach students/professors to more eco-friendly practices.

9. Competitors

Indirect Competitor

Based on the European Commission, reducing the consumption of bottled water will help households save money and at the same time cut plastic waste and greenhouse gas emissions.

Biggest competitors

- **Brita**

Our water filter costs 776,8 euros, much less than Brita's at 5000 euros. Compared to our filters which consist of microorganisms she uses she uses carbon filters to ensure a better quality of water. Compared to that one our product is simple, easy to use and maintain, cheaper and better for the environment.

- **Water Fontaine**

On average a water fountain costs 300 euro with a capacity of 20 liters and the water carboy costs on average 20 euro. So this solution is a bad investment due to the initial price of the fountain and of the water carboy being a little expensive. Then, this solution is not a solution for the ecological aspect because it uses a lot of plastic.

10.Added value

The difference between us and the competitors is that we are using microorganisms, that help to remove the contaminants that are in the water. We not only want to improve the quality of the water but also in the long term to reduce the usage of plastic. Our system offers a simpler and more accessible approach to water treatment due to reliance on natural processes instead of complex machinery and chemicals. The product itself is very simple which leads to easier installation, operation, and maintenance, making it accessible to a wider range of users. Compared to the carbon filters we are trying to reduce plastic and polluted waste. This means that our filters are reusable and won't create more waste than the regular ones. We must develop a sustainable technology, that will be accessible to a wide range of people for whom the existence of drinking water won't be a problem anymore. This product represents an investment for the future for customers and in the long term it will save money compared to the competitors. The filters need to be changed once a year, but due to its reusability they do not create more waste than the regular ones.

11.Future Company Potential

For the future, our company aims to develop the most sustainable technologies. The focus will be on developing a sustainable company with technologies that are accessible to a wide range of people, and to which the existence of drinking water is no longer a problem. A growing concern for the quality of potable water and the impact that water has on health, such as the diseases transmitted through contaminated water, we aim for the future to create as many sustainable products as possible and to reduce the level of pollution as much as possible. This planet is the only one we have, let's take care of it together.

Projet 2.2 Level-Zero - H2wOw

Frugal innovation – Erasmus+ project

Nathan Malbranque

Richard Klein

Alexandra-Ioana Simon

Cătălin Arsene

Samuel Štefek

Nikolay Stoimenov

Adrian Mînzat

Stoyan Cholakov **18. 04. 2024**

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1 Introduction

Dirtiness of the water is the main problem we, as humans, face. One of the four people across the globe lacks access to safe drinking water. This is a major health risk because unsafe water is responsible for more than a million deaths each year. This issue brings us to the need of controlling the safety of the water we drink daily. For this, we can find in the world multiple solutions, for example: detection of water pollution: developing low-cost biosensors that use microorganisms or specific proteins to detect the presence of contaminants in water. These biosensors could be integrated into portable devices or easy-to-use test kits for local population. Other solutions include chemical immediate tests in order to check water and pollution.

Most of the products on the market are costly in terms of resources and time. CITEUROPASS focuses on frugal innovations – by frugal, we mean, characterized by or reflecting an economical approach in the use of resources. As a process frugal innovation discovers new business models, reconfigures value chains, and redesigns products to serve users who face extreme affordability constraints, in a scalable and sustainable manner. It involves either overcoming or tapping institutional voids and resource constraints to create more inclusive markets.

Simply said, frugal innovation provides functional solutions through few resources for the many who have little means. Our goal, through the CITEUROPASS project is to provide a non-chemical, eco-friendly and frugal solution to the problem of water testing.

2 Company information

Name of the company: Level-Zero, PLC. **Type of**

the company: Public Limited Company **Logo:**

Logo info: The green atom-like elements of the logo suggest a focus on environmental science and technology, fitting for a company producing ecological products. The green color is often associated with sustainability and eco-friendliness, while the orbiting rings and central nucleus symbolize a scientific approach to ecological issues. The modern font used for "Level-Zero" conveys a sense of innovation and forward-thinking, which aligns with our values and the development of cutting-edge tools for detecting water pollution. This logo communicates a commitment to environmental health and a scientific foundation in product development.

Motto: „H2wOw – Safe water at home“

Headquarters Office: 339 Avenue Centrale, 38400 Saint-Martin-d'Hères, Grenoble, France

Founders of the company: Nathan Malbranque, Richard Klein, Alexandra-Ioana Simon, Cătălin Arsene, Samuel Štefek, Nikolay Stoimenov, Adrian Mînzat, Stoyan Cholakov

Name of the product: H2wOw

3 Product information

3.1 General idea

Detection of water pollution and developingn low-cost biotech that use microorganisms or specific proteins to detect the presence of contaminants in water was the main issue our project wants to solve. By using microorganisms the prototype could be integrated into portable devices or easy-to-use household test kits for local populations.

How is biotech used we in this idea?

Biotechnology can be designed to target different types of contaminants, such as toxic chemicals, heavy metals, pathogenic bacteria or pesticides. The micro-organisms or proteins used are selected for their ability to interact selectively with the target contaminants, enabling accurate and sensitive detection. They can then produce a luminescent response, change colorimetry, or pH in the presence of certain pollutants, or specific antibodies can be used to detect the presence of toxins in water.

How do we turn this idea into a saleable product?

The key advantage of biosensors is their low cost and ease of use. By integrating these biosensors into portable devices or easy-to-use test kits, they can be deployed in the field to carry out rapid and accurate water quality tests.

Why is it frugal?

We are responding to a primary human need: hydration. It's a sustainable project, because it uses biotechnology rather than technological tools.

We are making this product accessible and affordable:

- Either through open documentation to make it accessible by publishing plans and detailed instructions on how to make and use the device in open access, to enable other communities to reproduce and modify the device to suit their own needs and resources. By using a simplified design so that it can be made with simple tools and skills, such as basic carpentry or light welding, to facilitate manufacture in contexts with limited resources.
- Or by selling it at a very accessible price

3.2 H2wOw – the product

The prototype called **H2wOw®** is a new innovative product that consists of several components. You can read more information in the chapter *3.4.2 – User manual*

3.3 Prototype production

This part of the document explains the product itself, the features of the prototype, how this prototype was created, the 3D model itself, the instructions for use for the potential buyer and its usability in everyday life.

3.3.1 The 3D model

The 3D model is made from recyclable degradebale plastic that is produced by a 3D printer.

We will observe the artemias in a micro-reduced microscope and use our smartphone light to arthemias to be visible:

- it is a holding element for the microscope observation glass slides,
- it has light LED + battery at the bottom,
- on top of that comes the glass sliders with the microorganisms,
- on top it has a lens.

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Imaging
and experiencing
our european citizenship

UGA Université Grenoble Alpes

UMB MATEJ BEL UNIVERSITY

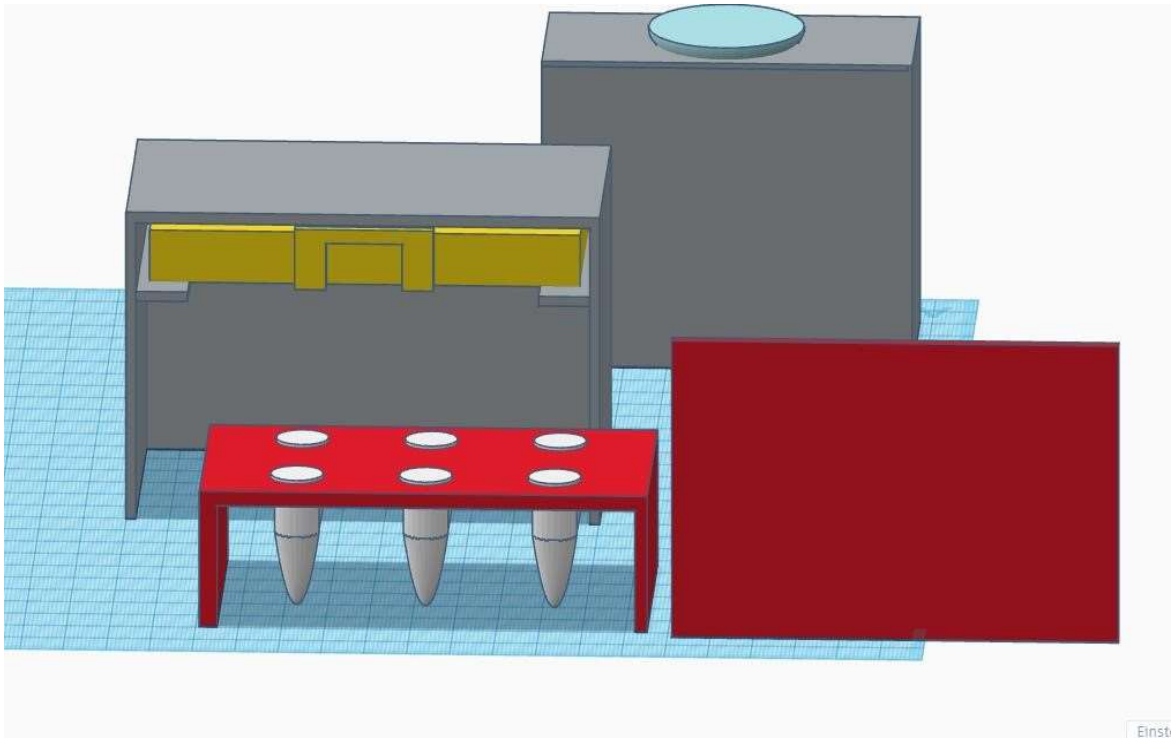
UNIVERSITY OF ECONOMICS IN BRATISLAVA

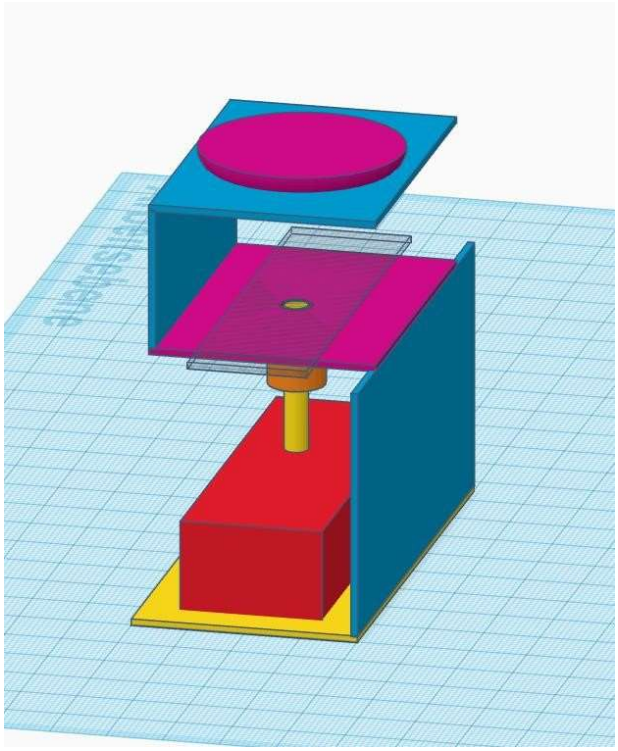
NEW BULGARIAN UNIVERSITY

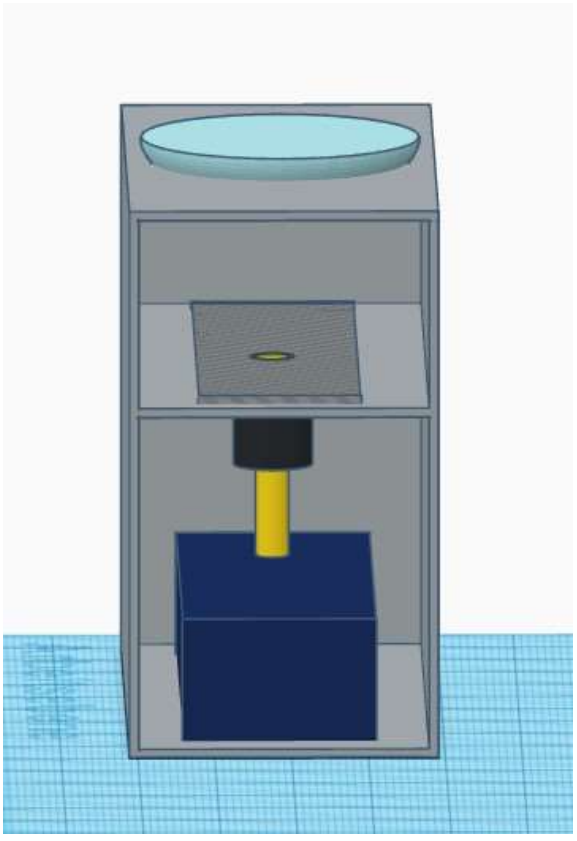
ALEXANDRU IOAN CUZA UNIVERSITY of IAȘI

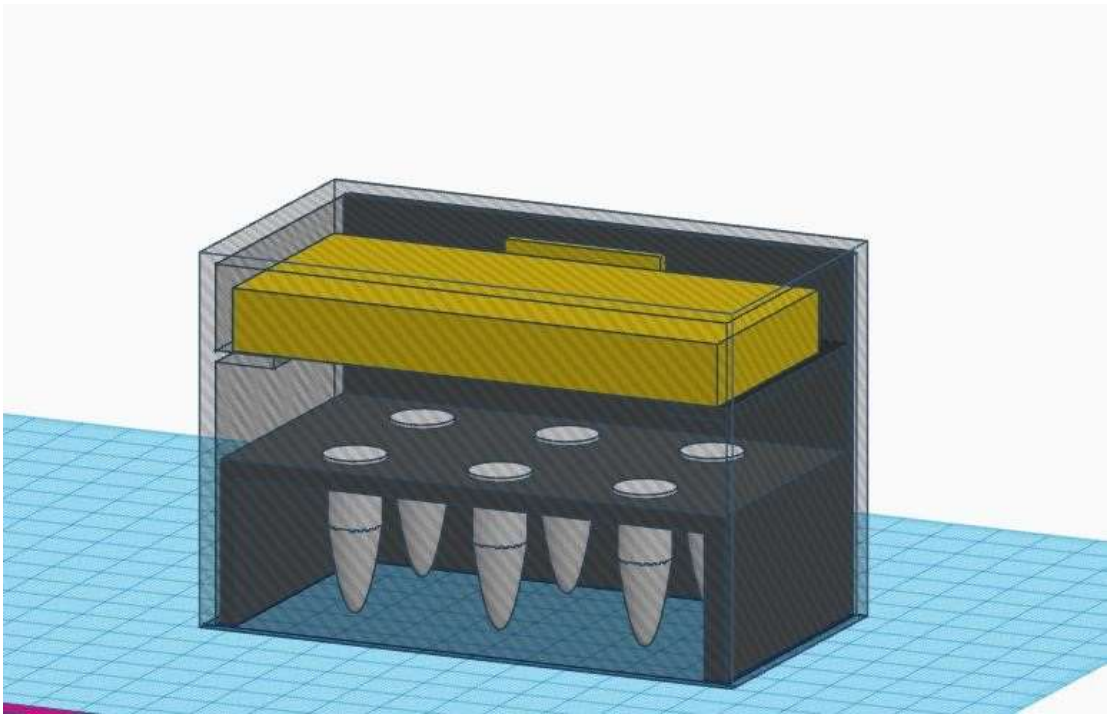
KIK

NEMETON









3.4 How the prototype works

3.4.1 Parts of the prototype

The box or packaging is symbolysed by the transparent rectangle:

Storage of the eggs (in red):

The eggs need a part where they can be put when they are in their dormant state. We need to inquire info on what do we have to do to keep them in this state in good conditions

An incubator (in blue) :

provide controlled temperature conditions during cyst hatching and toxicity testing. Incubators are generally set at specific temperatures to promote the growth and development of test organisms, ensuring optimal conditions for successful testing.

A pipette (and the small triangles represent the notches that fix it to the box)

They enable the chemicals to be tested, the dilution solutions, the culture media and the test organisms themselves to be accurately dosed into the containers. **Growth Patterns** (in grey) all the information and illustrations of the different reactions of the artemias : how are they evolving depending on the quality of the water. It includes all the explanations on what state equals in term of water quality

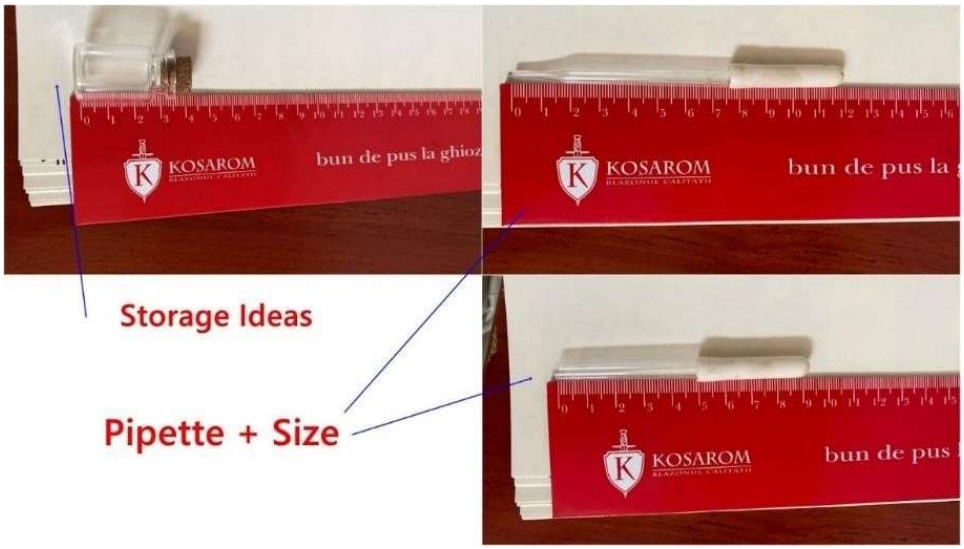
Microscope (in yellow)

It is the most important part : We put the eggs in the incubator thanks to the pipette. Then we take some with the pipette again, and analyse with the microscope. To know how to interpret the data, just compare with the exemples that are compiled in the book

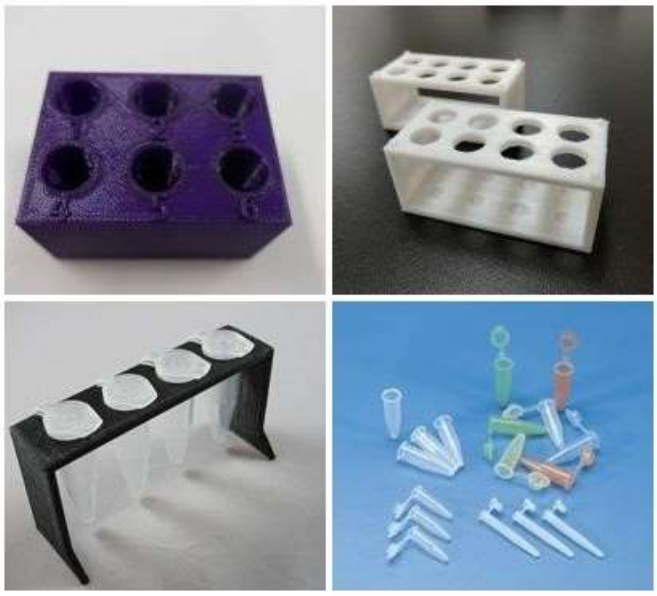
Artemias - test organisms are supplied in the form of dormant or immobilized cysts that can be stored for months and activated at the time of ecotoxicological testing, Read more information in chapter *4 – Biological background – Artemias.*

3.4.2 User manual

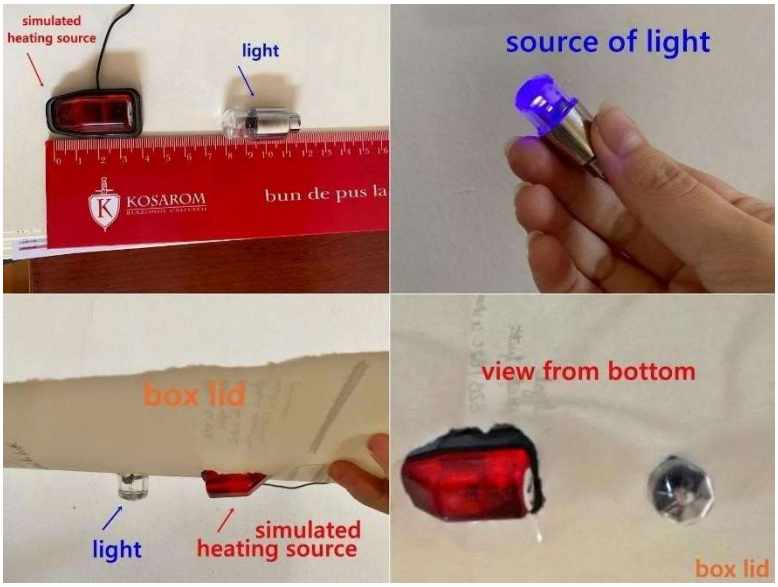
1. **The Artemias Eggs** - coming already premixed with seasalt, it will be needed to put them into the prototype a with a pipette.



2. **A microtube rack** - easily made, there are templates already out there on the internet because the microtubes are standardized



3. We put the premixed artemias and sea salt with water in a microtube and then in the rack. They need to stay and hatch for 24 hourw in light and warmth by using the light heater.


simulated heating source
light
KOSAROM
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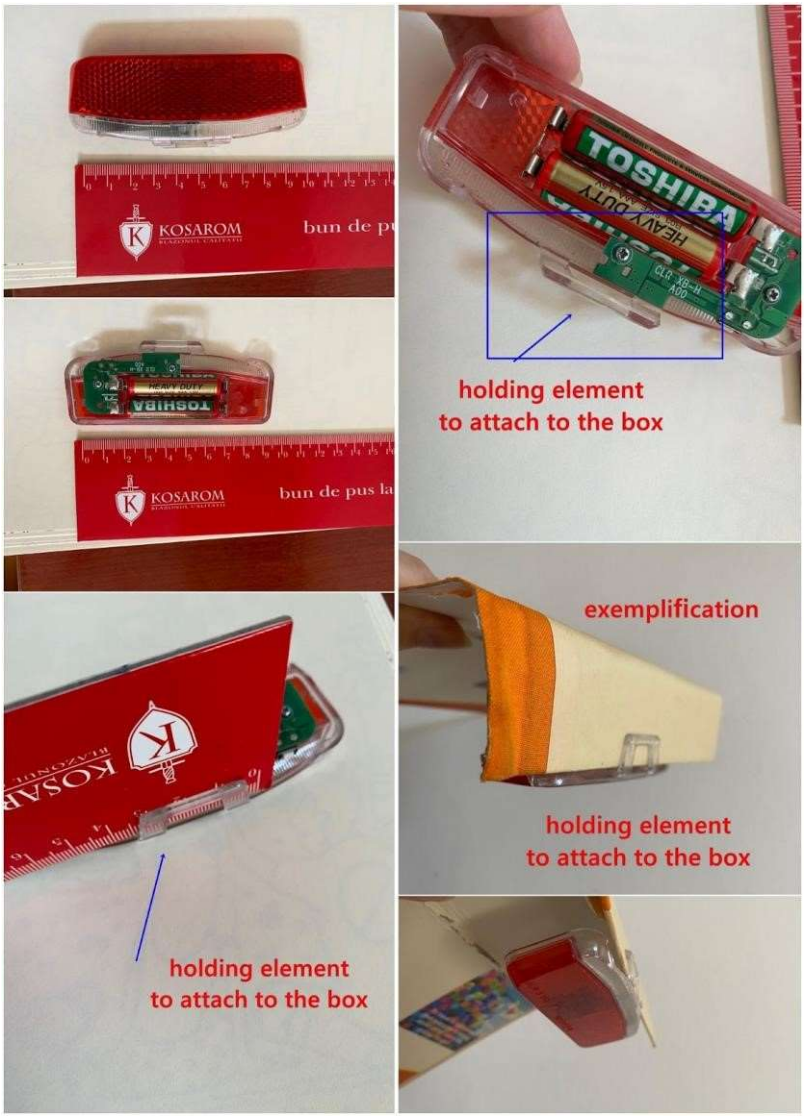
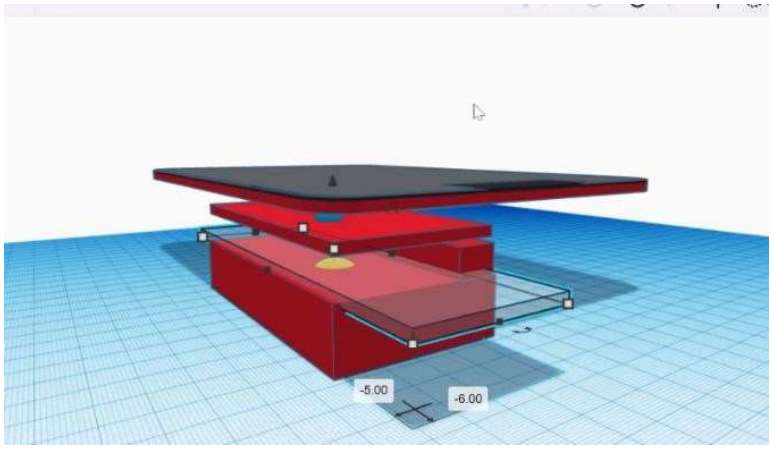
source of light
box lid
light
simulated heating source
view from bottom
box lid

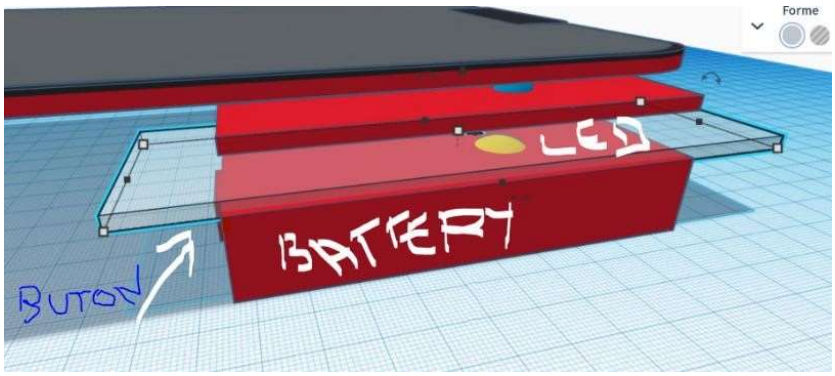


4. After 24 hours, in which the Artemias had received light and heating, we can observe them. We will pick them up from the microtube with a pipette and put them.

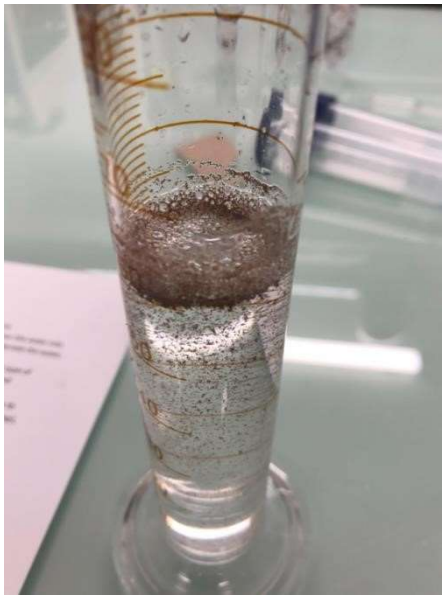
5. Here comes the fun 3D part. We will observe the Artemias in a MicroReduced Microscope and use our smartphone torch.

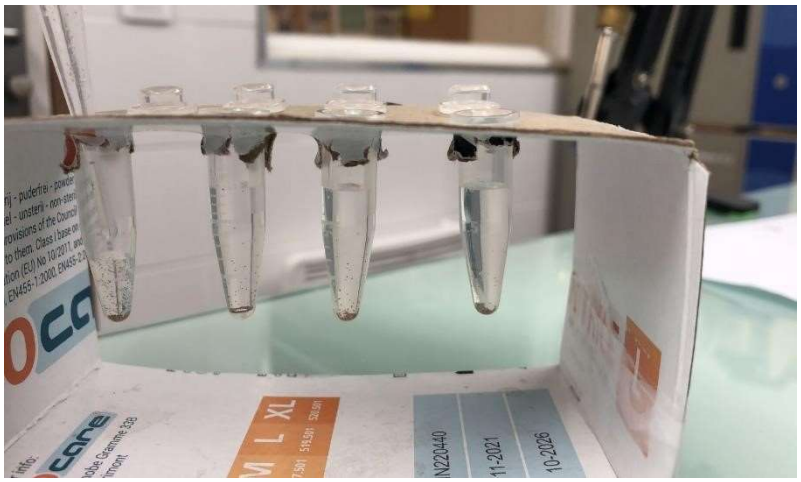
- it is a holding element for the Microscope observation glass slides
- it has light LED + battery at the bottom
- on top of that comes the glass sliders with the microorganisms
- on top it has a lens

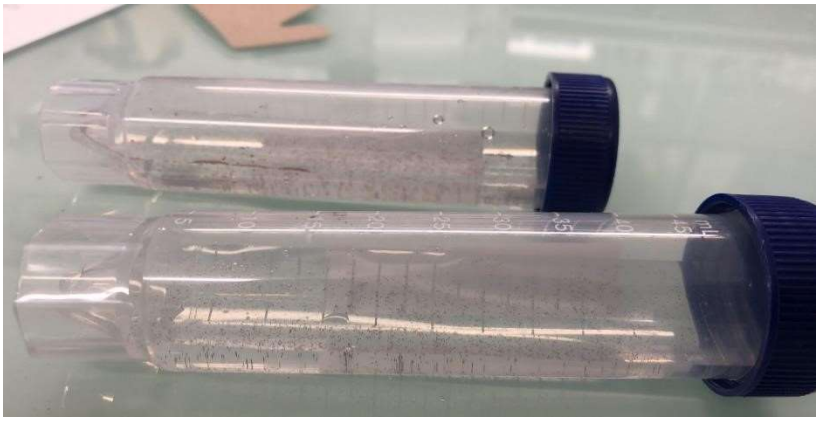




Pictures of the first test of hatching artemias in microtubes







CITEUROPASS
Imaging and experiencing our european citizenship

UGA Université Grenoble Alpes · UMB Matej Bel University · University of Economics in Bratislava · New Bulgarian University · Alexandru Ioan Cuza University of Iași · KIK · Nemeton

3 STEPS TO TEST YOUR WATER

1 ARTEMIAS PREMIX + WATER

- prepare your water sample and the testing tube
- add 1 pack of Artemias premix to 45ml. water in the testing tube

2 INCUBATE 24 HOURS

- turn on the light and the heating source of the incubator
- lay the testing tube with the water + Artemias in the incubator
- wait for 24 hours

3 OBSERVE THE RESULT

- use the pipette to put a drop of the tested water on the microscope lens
- turn on the observing light
- see if there is any movement in the sample

CAN YOU OBSERVE MOVING ORGANISMS?

→ ✗ **THE WATER IS NOT SAFE TO DRINK**

→ ✓ **THE WATER IS SAFE TO DRINK**

4 Biological background

4.1 Detection of Water Pollution

We aim to create low-cost biosensors for detecting water pollutants. These sensors, using microorganisms or proteins, would respond to contaminants with a visible change, facilitating easy and accurate water quality assessment. The goal is to integrate these biosensors into portable devices or test kits for widespread use, particularly benefiting hikers and rural communities.

Feasibility and Suggestions:

- **Bioindicator Prototyping:** Focus on developing bioindicators as a viable prototype. Consider the feasibility and sustainability of "frugalizing" this technology to offer an innovative solution compared to existing methods.
- **Organism Storage:** Address the challenge of storing living organisms. Research organisms that undergo natural desiccation, allowing for easy rehydration and indicating water quality through growth patterns. This could bypass the need for costly lyophilization processes. The best possibility are Artemias.
- **Comprehensive Testing Kits:** Despite the existence of similar kits, none offer a comprehensive, all-in-one device. Aim to develop a simple, affordable device that congines all necessary features for water quality testing without requiring lab equipment.

4.2 Artemias

Artemias, also known as Artemia, are small aquatic crustaceans belonging to the genus Artemia. They are commonly referred to as brine shrimp due to their ability to thrive in saline environments. Artemias are notable for their adaptability to extreme conditions, particularly high salinity levels, which allows them to inhabit saline lakes, salt flats, and coastal saltwater bodies.

These microorganisms are significant in aquaculture and scientific research due to their unique biological characteristics. One of their notable features is their ability to produce dormant eggs known as cysts, which can remain viable for extended periods under adverse environmental conditions such as desiccation or freezing. When conditions become favorable, these cysts hatch, releasing nauplii (larvae) that rapidly grow into mature brine shrimp.

5 Commercial parts

5.1 Business model

The business model we decided on is a variation of the product-based business model, specifically focused on a consumables or subscription model.

Product-Based Model: Our core product is the water testing kit, which includes a set number of tests (in our case, 5-20 tests). This kit is a physical product that customers purchase initially to conduct water testing individually in their household or outside.

Consumables or Subscription Element: The additional revenue stream comes from selling more tests beyond the initial kit. After customers have used up the tests included in the kit, they can purchase additional test refills or packs from our website. This creates an ongoing revenue opportunity through repeat sales of the testing consumables.

Revenue Generation: Revenue is generated through the initial sale of the testing kit and subsequent sales of refill tests. The pricing strategy for the kit considers the cost of production, desired profit margin, and market competition – more details are given below, in the financial part. The pricing for refill tests is structured to encourage repeat purchases and customer loyalty.

Customer Engagement and Retention: Offering additional tests for sale promotes ongoing customer engagement and encourages repeat business. Our testing kit and refill tests are userfriendly, accurate, and provide value to customers, thereby fostering customer satisfaction and retention.

Potential for Upselling and Cross-selling and Further Development: As part of this model, there is potential to upsell or cross-sell related products or services. For example, you

complementary water treatment solutions or personalized consultation services based on the test results.

Sustainability and Environmental Considerations: Given the environmental concerns associated with chemical residue from other water testing kits, emphasizing sustainable practices in our product development and marketing is for us a unique selling point, appealing to environmentally conscious consumers.

In summary, our business model combines the sale of a physical product (water testing kit) with ongoing sales of consumables (additional test refills). This model leverages initial customer acquisition to establish a recurring revenue stream, while also fostering customer engagement and potential for expansion into related offerings within the water testing and treatment sector.

5.2 Competitors and Partners

The competitors of our product split into two categories: chemical (instant or noninstant) water tests and local authorized laboratories. Further, we will shortly present how they work and their advantages and disadvantages.

Chemical water tests, whether instant or non-instant, utilize chemical elements to detect water pollutants and assess the presence of various elements in the sample. These tests can yield immediate or delayed results and typically range in price from 5 to 30€ based on our findings. However, a notable drawback is the chemical residue they leave behind, contributing to environmental concerns. Additionally, human error during handling can compromise the accuracy of these tests, posing challenges in obtaining reliable results.

One advantage of chemical water tests is their ability to quickly detect contaminants and provide prompt feedback on water quality. They offer a cost-effective option for assessing water purity, especially for routine monitoring or preliminary assessments. Moreover, these tests can be performed on-site without the need for specialized equipment, enabling convenient and accessible water testing.

Despite their benefits, chemical water tests have significant disadvantages. The chemical residue generated during testing raises environmental sustainability issues, and the production process itself may not be eco-friendly. Furthermore, the accuracy of results can be compromised by human error, impacting the reliability of the test outcomes. These factors underscore the importance of considering alternative testing methods that minimize environmental impact and enhance result accuracy.

Local authorized laboratories - water testing conducted by laboratories is essential for assessing the quality and safety of water supplies. Labs perform comprehensive analyses to detect contaminants such as bacteria, heavy metals, chemicals, and other pollutants that may pose risks to public health or the environment. They use specialized equipment and validated methods to ensure accurate results, providing valuable data for regulatory compliance and informed decision-making.

Using laboratories for water testing offers several advantages. Firstly, labs provide accurate and reliable results due to their expertise and sophisticated testing methods. This ensures that water quality meets regulatory standards and helps identify potential issues early. Secondly, labs offer comprehensive testing, covering a wide range of contaminants beyond basic parameters like pH and turbidity. This helps in understanding the overall quality of water and any potential risks associated with its use. Lastly, labs provide guidance on interpreting results, enabling stakeholders to take appropriate actions to address water quality concerns.

Despite these advantages, there are some drawbacks to relying on labs for water testing. Cost is a significant factor, as professional testing can be expensive, especially for comprehensive analyses or specialized testing. Additionally, the process can be timeconsuming, involving sample collection, transport to the lab, testing, and result reporting, which may delay response to urgent water quality issues. Lastly, interpreting complex results may require expertise, posing a challenge for non-experts who rely on lab reports for decision-making.

5.3 Marketing strategy

The Water Testing Market size is estimated at USD 4.35 billion in 2024, and is expected to reach USD 5.70 billion by 2029, growing at a CAGR of 5.57% during the forecast period 2024 – 2029.

The COVID-19 pandemic had a significant impact on the global water testing market as it affected consumers' lifestyles and increased their chances of spreading coronavirus. Thus, the water and supply chain industries were impacted as consumers became more concerned regarding the security and safety of water-based products. Additionally, in the wake of the pandemic, government bodies, agencies, and Non-Government Organizations have also been contributing significantly to the rising demand for safety across the country.

Over the long term, in developing countries like India, consumable water is expected to be safe and of high nutritional value due to increasing consumer awareness. The rise in consumption of bacteria- and chemical-free water is driving the demand for water testing equipment across the globe.

5.4 Target Audience

PERSONA

We want to revolutionize the way households and businesses perceive water safety. We firmly believe that our product is a must-have in this day and age. We want to create a water quality standard that can clearly tell the customers that the business regularly does check-ups of their water so they know what they are drinking. Our recommendation for hotels and restaurants is to perform 3 check-ups on a weekly basis, for households every two weeks. For example in many countries, tap water is being served by defaul with each meal.

- Every household

- Restaurants
- Hotels
- Small businesses/office

5.5 Financing

You can find the information about the costs of the material in the following table:

Item	Price (in Euros)
Box	2,00 €
Heater	2,50 €
Light	1,50 €
Lens	0,50 €
Eprubete	0,20 €
Pipete	0,20 €
Microscopic glass	0,20 €
Instruction paper	0,20 €
Artemis	0,20 €
Labour	1,00 €
Transportation	0,75 €
Advertisement	0,75 €
Storage	0,75 €
Profit	**5,00 €**
Taxation – (net price 2,60 € + labour 0,40 € + profit taxation 1 €)	4,00 €
Final price of the product	**19,75 €**

The final price of the product of the prototype is **19,75 €.** The Artemias packets: 0,05 € for artemias and salt mixture + 0,03 € for paper = 0,08 € of the costs for the packet. The selling price is 0,25 € / 1 packet.

A NOTE FOR THE FUTURE INVESTOR:

We are asking for 100 000,00 € in exchange for a 40 % stake at our company with the agreement that we can buy the minimum of 50 % of the shares back after 2 years.

6 Conclusion

Frugal innovations are extremely important in today's modern world. In cooperation with the CitEuroPass project, which enables students from foreign universities - in this case France, Slovakia, Bulgaria and Romania on the topic of "clean water". Based on foreign cooperation, we managed to create the company called Level-Zero, which developed the prototype "H2wOw", which helps determine, based on artemia, whether the water we drink daily is safe. This project, as well as the document, will serve the Université Grenoble Alpes and other institutions for review, as well as inspiration for the creation of this prototype with the investment interest of investors.

Projet 3.1 : CoTeam – BioWrap

Viktória Švarcová, Denisa Švecová, Victoria Macari, Alma Moghaddam Bayramzadeh, Kevin Cardenas

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1 INTORDUCTION

In the quaint and picturesque city of Grenoble, France, nestled behind a cluster of student residences, lay a small, unassuming garden. On one particularly rainy afternoon, a group of students from diverse corners of the world found themselves gathered there, seeking refuge from the downpour and engaging in a conversation that would spark an extraordinary idea.

Denisa and Viktória, both hailing from Slovakia, were reminiscing about their childhoods. They spoke fondly of the gardens in their village, which had been a lifeline for their families during tough times. These gardens weren't just a source of food but also a testament to the resilience and resourcefulness of their community.

Victoria, from Romania, shared her own memories. Her father, a teacher in the countryside, had a unique approach to education. He taught his students the art of composting, using leftover food and tiny insects to revitalize the barren school gardens. This not only made the gardens flourish but also instilled in the children a deep respect for the earth.

Kevin, from Ecuador, talked about the rich soil of the Amazon rainforest. He described how the nutrient-dense earth supported a vast ecosystem, teeming with life. His stories painted a vivid picture of a land where nature's abundance was both awe-inspiring and humbling.

Alma, from Iran, recalled her grandmother's ingenious method of preserving seeds during droughts. Her grandmother's wisdom ensured that even in the harshest conditions, life could find a way to endure. This traditional knowledge was a treasure trove of practical solutions passed down through generations.

As they listened to each other's stories, a remarkable realization dawned on them. Despite their different backgrounds and experiences, they all shared a profound connection to the earth. This common thread wove their narratives together, creating a tapestry of shared values and insights.

In that moment, an idea began to take shape. They wondered if it was possible to blend traditional wisdom with modern science to create sustainable solutions for soil health worldwide. Could the old ways of nurturing the land be enhanced by new scientific discoveries to benefit the environment on a global scale?

This question ignited a spark of inspiration within the group. They saw the potential for a project that could bridge the gap between tradition and innovation, fostering a deeper understanding and appreciation for the earth. With their diverse backgrounds and shared passion, they were uniquely positioned to explore this idea further.

And so, in that small garden in Grenoble, a seed of an idea was planted. It was an idea that held the promise of growth, sustainability, and a deeper connection to the ground that sustains us all. The students knew that their journey had just begun, but they were eager to see where this path would lead them.

Picture 1: Logo

Picture 2: CoTeam + Prototype

1.1.The Soil Health Problem

In contemporary Europe, one of the most pressing environmental challenges is the deteriorating health of our soils. According to the European Environment Agency, a staggering

60 to 70% of soils within the EU are classified as unhealthy. This alarming statistic underscores the urgent need for action to address the multifaceted issues plaguing our soil.

One of the primary causes of soil degradation is the loss of essential nutrients. Intensive farming practices, which prioritize high yields over sustainability, often strip the soil of its natural fertility. This nutrient depletion leaves the soil barren and incapable of supporting robust plant life, leading to reduced agricultural productivity.

Soil compaction is another significant issue. Heavy machinery and overgrazing can compress the soil, reducing its porosity and limiting the movement of water, air, and nutrients. Compacted soil becomes a hostile environment for plant roots and beneficial microorganisms, further exacerbating the problem of nutrient depletion.

Erosion, caused by wind and water, is yet another factor contributing to soil degradation. Erosion not only washes away valuable topsoil but also leads to the loss of organic matter and nutrients. This process can transform once-fertile lands into unproductive wastelands, making them unsuitable for agriculture.

The overuse of chemical fertilizers and pesticides compounds these issues. While these chemicals can temporarily boost crop yields, they have long-term detrimental effects on soil health. Chemical fertilizers can disrupt the natural balance of soil ecosystems, leading to a decline in soil fertility over time. Pesticides, on the other hand, can harm beneficial insects and microorganisms, further degrading the soil.

The reliance on chemical fertilizers and pesticides also has broader environmental implications. These chemicals can leach into water bodies, causing pollution and harming aquatic life. Additionally, the overuse of pesticides can lead to the development of pesticide-resistant pests, creating a vicious cycle that requires even more potent chemicals to manage.

Small farmers, who are often the backbone of rural economies, face unique challenges in this context. They frequently lack access to affordable, eco-friendly solutions that could help them maintain soil health. Most new technologies are either too expensive or not designed with small-scale farming in mind, leaving these farmers with limited options for sustainable practices.

The consequences of unhealthy soil are far-reaching. Reduced agricultural productivity means less food, which can lead to food insecurity and higher prices for consumers. The loss of biodiversity, both above and below the ground, can disrupt ecosystems and make them less resilient to environmental changes. Furthermore, degraded soils are less effective at sequestering carbon, exacerbating the challenges posed by climate change.

Given these challenges, there is an urgent need for simple, low-cost, and sustainable solutions to improve soil health and support small farmers. By combining traditional knowledge with modern science, we can develop innovative practices that restore soil fertility, promote biodiversity, and contribute to a more sustainable future.

1.2.Our Innovative Solution

In response to the pressing challenges of soil degradation and the need for sustainable agricultural practices, we have developed a groundbreaking solution: a microbial seed coating designed to naturally enhance soil health and support plant growth. This innovative approach addresses several key issues faced by small farmers and the environment.

Affordability: Our microbial seed coating is incredibly low-cost, making it accessible to small farmers who often struggle with financial constraints. By utilizing local materials and agricultural waste, we ensure that the production process is economical and environmentally friendly. This cost-effective solution empowers farmers to improve their soil health without breaking the bank.

Ease of Use: One of the standouts features of our microbial seed coating is its simplicity. Farmers can easily apply it by hand or with basic tools, eliminating the need for specialized machinery. This user-friendly design ensures that even those with limited resources can benefit from this technology, making it a practical solution for small-scale farming operations.

Sustainability: At the heart of our solution is a commitment to sustainability. Instead of relying on harmful chemicals that can damage the soil and environment, we harness the power of beneficial microbes. These tiny living helpers work in harmony with the soil to support plant growth and protect crops from pests and diseases. By promoting a healthy soil ecosystem, our microbial seed coating contributes to long-term soil fertility and environmental resilience.

Benefits for Farmers and the Environment: Our microbial seed coating offers a simple, natural, and effective solution tailored to the needs of small farmers. By enhancing soil health, it helps increase crop yields, reduce the need for chemical inputs, and promote biodiversity. This not only benefits farmers by improving their livelihoods but also contributes to a more sustainable and resilient agricultural system.

In summary, our microbial seed coating is a game-changer for small farmers and the environment. It is affordable, easy to use, and sustainable, providing a natural way to support soil health and plant growth. By embracing this innovative solution, we can help create a more prosperous and eco-friendly future for agriculture.

2 BIOWRAP

2.1.Production & Application Process

The Biowrap production workflow integrates microbiology and material science to deliver a consistent, high-quality microbial seed coating. First, selected beneficial strains are cultured under optimal laboratory conditions to ensure purity and vigor. These live cultures are then blended into a carrier gel composed primarily of biocompatible polymers (e.g., agar and alginate), which creates a protective microenvironment for the microbes. The gel formulation is engineered to avoid toxic or inhibitory components, maintain suitable moisture levels, and include mild binders such as carboxymethyl cellulose to support both seed adhesion and microbial viability. Coating is applied via slurry or film techniques, ensuring uniform coverage without impeding seed germination. After coating, seeds undergo a gentle drying phase at controlled temperature and humidity to stabilize the gel matrix while preserving microbial viability. Finally, coated seeds are funneled into packaging under low-humidity conditions to prevent premature activation of the microbes.

2.2. Packaging

Biowrap's packaging is designed to sustain microbial viability throughout storage and transport, while aligning with environmental goals. Each box contains five distinct seed sachets, clearly labeled to guide end-users on seed variety and planting instructions. The outer carton and inner sachets use biodegradable materials—such as compostable films and recycled paperboard—that provide a moisture-barrier yet allow gas exchange necessary for the microbes' survival.

Key features include:

- **Moisture Control:** Integrated desiccant paper layers regulate internal humidity, preventing gel overhydration or desiccation.
- **Biodegradability:** All components break down within 6–12 months under industrial composting conditions, minimizing plastic waste.
- **Organized Layout & Clear Instructions:** Color-coded sachets and pictogrambased guides reduce user error, supporting adoption by novice gardeners.

Tested Shelf-Life: Accelerated storage trials have shown >80% microbial viability after 3 months at 20 °C and 40% RH, matching benchmarks for commercial inoculants.

2.3. Added Value

Environmental Impact: Biowrap replaces synthetic fertilizers and pesticides with living biological allies, significantly reducing chemical runoff and greenhouse gas emissions associated with conventional inputs.

Soil Health: The applied microbes enhance rhizosphere diversity, promoting nutrient cycling (e.g., nitrogen fixation and phosphorus solubilization) and improving soil structure over successive crop cycles.

Regulatory Compliance: Field trials demonstrate up to a 20% increase in germination rate and improved seedling stress tolerance under saline conditions, aligning with EU efficacy standards for plant growth–promoting microorganisms.

Yield & Quality Gains: On average, farmers using Biowrap report a 15–25% yield increase in vegetable trials, alongside enhanced fruit quality metrics such as higher ascorbic acid content and firmer texture.

2.4.Legal & Regulatory Pathway for EU Market Entry

Biowrap holds an active patent covering the microbial blend and gel formulation, securing intellectual property rights across key jurisdictions. Compliance milestones include:

1. **Patent Protection:** EU Patent Office grant, ensuring exclusivity for the core coating technology.
2. **Safety & Efficacy Certification:** Meeting OECD and ISO guidelines for microbial inoculants, supported by GLP-compliant dossier submissions.
3. **Sustainable Packaging & Labeling:** Adherence to (EC) No 1107/2009 for biopesticides and (EU) 2019/1009 for biofertilizers, with full traceability data and user safety information.
4. **Market Entry Preparation:** Compilation of agronomic performance data and quality-control protocols to satisfy Member State regulatory authorities before product launch.

2.5.Competitive Landscape

The microbial seed treatment market is currently dominated by established players such as Pivot Bio, Bayer, and Inocucor (now Concentric Ag). These companies primarily cater to large-scale commercial agriculture, with solutions designed for high-volume operations and focused on a limited range of major crops like corn and wheat. Products are often sold in bulk quantities, require specialized application equipment, and commonly incorporate synthetic carriers or additives to support industrial distribution.

In contrast, Biowrap is purpose-built for the needs of small-scale growers, educational institutions, and community initiatives. We offer an eco-conscious, userfriendly solution that bridges the gap between advanced microbial technologies and accessible, everyday use. Our core differentiators include:

- **100% Natural & Eco-Friendly Composition**: A biodegradable gel based on agar and alginate, enriched with live beneficial microbes—entirely free of synthetic chemicals or additives, and safe for organic systems.
- **Ready-to-Use Seed Format**: Seeds are pre-coated and ready for planting, with no need for specialized equipment or extra preparation—just sow and grow.
- **Localized Microbial Blends**: Custom consortia of microbes are tailored to local soil conditions and specific crops, ensuring maximum effectiveness and soil compatibility—something rarely offered by large-scale providers.
- **Right-Sized Packaging for Small Operations**: Offered in small-batch quantities ideal for home gardens, schools, and community plots—without compromising on performance or scientific integrity.
- **Boosted Germination & Early Growth**: The gel matrix enhances moisture retention and nutrient delivery, promoting uniform seedling emergence and stronger early development.
- **Support Beyond the Product**: Backed by educational resources, tutorials, and outreach, Biowrap empowers growers to adopt microbial technologies with confidence, knowledge, and community support.

3 BUSINESS MODEL

Biowrap operates on a hybrid B2B and B2C model, established from the outset to prioritize scalability, purpose, and profitability. The business model is structured around the Business Model Canvas framework and is carefully designed to grow both impact and revenue.

Customer Segments include urban gardeners, families, educators, schools, NGOs, eco-conscious retailers, and municipal governments.

The Value Proposition is centered on pre-coated seeds with climate-resilient microbial formulations. These seeds are regionally adapted, packaged in compostable materials, and designed to simplify complex science into practical, sustainable solutions.

Revenue Streams are currently derived from standard packs (13.99 €), school kits (110 €), and soon-to-launch refill sachets (5.99–7.99 €).

Key Activities involve microbial R&D, localization of products to regional needs, development of educational materials, order fulfillment, and onboarding of new partners.

Channels include Biowrap's official website, Amazon Handmade, Etsy, ecoretailers, school districts, and NGOs.

Key Partners include seed suppliers, microbiology laboratories, packaging companies, educational networks, and logistics providers.

This model enables Biowrap to scale its community, sales, and environmental impact simultaneously, aligning profitability with purpose.

3.1. Marketing strategy

Biowrap's marketing strategy operates through two primary verticals: B2B and B2C.

B2B (Schools, NGOs, Municipalities): The company provides educational kits aligned with science and sustainability curricula. It collaborates with school networks, urban agriculture programs, and NGOs to co-create garden-based learning experiences. B2B marketing tactics include participation in educational fairs, outreach to school districts, and partnerships in green municipal projects.

B2C (Urban Gardeners and Eco-Conscious Consumers): Marketing in the consumer segment is focused on social platforms like Instagram, TikTok, and Pinterest. Content strategies include planting tutorials, accessible science explainers about microbes, and seasonal campaign themes. The emphasis is on ease of use, eco-friendly packaging, and the joy of gardening—even in compact urban spaces.

3.2.Market expansion strategy

Biowrap began its journey in France, which serves as both its headquarters and home market. From there, the company expanded into Germany, a country recognized for its robust eco-retail landscape and strong integration of science programs within schools. Belgium was also an early target, chosen for its bilingual education system and growing momentum in urban gardening initiatives.

Building on this foundation, Biowrap is now entering new European markets with strategic intent. In the Netherlands, the thriving urban farming scene and its role as an agri-tech hub make it an ideal environment for growth. Spain represents a promising opportunity, as demand increases for climate-resilient agricultural solutions. Romania offers a welcoming space for educational innovation and pilot programs, particularly within school systems. Meanwhile, Italy and Austria are appealing markets due to their focus on eco-luxury products and the support of green initiatives by local governments.

Across all markets, Biowrap adapts its microbial formulations and seed varieties to suit regional conditions. This localization is guided by surveys on seed preferences and data on local soil and climate, ensuring that each product is not only scientifically effective but also personally relevant to the user.

3.3.Distribution Channels and Partnerships

Biowrap distributes its products through a carefully structured network that integrates direct sales, institutional collaboration, and retail presence—each channel reinforcing the company's mission and reach.

The core of its direct-to-consumer distribution lies in its official e-commerce platform, biowrap.eco, supported by listings on curated marketplaces such as Amazon Handmade and Etsy. These platforms attract eco-conscious buyers seeking sustainable gardening solutions and allow Biowrap to maintain a direct relationship with its customers while preserving brand integrity.

In parallel, Biowrap works closely with institutions including schools, universities, NGOs, and local governments. These partnerships are formed primarily through educational and climate-focused programs, such as green school initiatives, urban agriculture projects, and community garden networks. By offering products that serve both educational and environmental purposes, Biowrap seamlessly integrates into these public and nonprofit ecosystems.

Retail distribution is another vital pillar of the strategy. Instead of relying on conventional supermarket chains—which often demand plastic packaging, impose high shelf listing fees, and offer low margins—Biowrap opts to work with eco-retailers, garden centers, and seasonal pop-up garden fairs. These outlets not only align with the brand's sustainability values but also provide a more targeted and engaged customer base.

Through this multifaceted distribution approach, Biowrap ensures that its products are accessible to a wide range of users while maintaining control over its environmental standards and brand positioning.

4 FINANCIAL OVERVIEW

Biowrap has built a financially sustainable business model from the very beginning, combining clear pricing, healthy margins, and a lean operational setup to support steady growth.

The current product portfolio includes standard packs priced at 13.99 €, which contain four varieties of microbially coated seeds, along with a planting guide, informational leaflet, QR code access to additional resources, and fully compostable packaging. For educational institutions, the company offers a comprehensive school kit priced at 110 €, which includes ten mini-packs, a teacher's manual, a growth chart, and a large wall poster designed to support curriculum-based learning. In addition to these, refill sachets priced between 5.99 € and 7.99 € are set to launch soon, providing a cost-effective and sustainable solution for returning customers.

Biowrap's cost structure is designed to maintain high profitability even at modest production volumes. With an average unit cost of approximately 6.50 € and a gross margin of around 53.5%, the company has already achieved profitability in its first year. This success is largely attributed to a lean production model supported by automated packaging processes and fulfillment partners distributed across Europe, allowing Biowrap to scale operations efficiently without significant overhead.

The company's financial forecast for the next three years projects steady and sustainable growth, both in terms of sales volume and net profitability:

Year	Units Sold	Revenue (€)	Net Profit (€)	Profit Margin (€)
2025	30 000	419 700 €	125 000 €	30%
2026	100 000	1 399 000 €	420 000 €	30%
2027	200 000	2 798 000 €	860 000 €	31%

Table 1: Financial forecast for the next three years

These projections reflect a solid foundation for long-term scalability, with consistently strong margins and increasing returns as volume grows. The company's approach to profitability—prioritizing automation, smart partnerships, and operational efficiency—positions Biowrap as a financially resilient and investment-ready enterprise, capable of expanding without compromising its environmental or ethical commitments.

5 CONCLUSION

Biowrap is more than a product—it's a movement rooted in shared stories, cultural heritage, and a vision for a healthier planet. What began as a heartfelt conversation in a rainy garden has evolved into a purpose-driven enterprise tackling one of Europe's most urgent environmental challenges: soil degradation. By combining traditional knowledge with cutting-edge

microbiology, Biowrap offers an accessible, sustainable, and scientifically robust solution tailored for small farmers, urban gardeners, educators, and eco-conscious consumers.

Its microbial seed coating not only enriches the soil naturally but also empowers communities to grow food more sustainably, without reliance on chemical inputs. Through thoughtfully designed packaging, localized microbial blends, and a hybrid B2C– B2B model, Biowrap scales its impact across multiple countries while staying true to its environmental and educational mission.

Financially, Biowrap stands on solid ground—achieving profitability early on with a lean, scalable model and strong growth projections. As it continues to expand across Europe, its blend of innovation, inclusivity, and integrity sets it apart in a crowded market.

In essence, Biowrap demonstrates how science, sustainability, and storytelling can come together to regenerate the very ground we walk on.

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By Soilution

Biodegradable Mycorrhizal Capsules for

Urban Soil Regeneration

Team 2

Executive Summary

ReSoil is an innovative, eco-friendly biotechnology designed to rejuvenate urban and degraded agricultural soils using biodegradable capsules infused with beneficial mycorrhizal fungi and microbial communities. Developed to address critical soil health challenges, ReSoil aligns perfectly with the EU's sustainability and environmental regeneration goals.

Problem Definition

Urban and agricultural soils across Europe face critical degradation due to compaction, nutrient depletion, microbial diversity loss, and contamination from industrial activities. Conventional remediation solutions often fail due to their complexity, environmental harm, high cost, or inefficiency. Healthy soil is vital to sustainable urban greening, agricultural productivity, and biodiversity conservation.

ReSoil – Product Overview

ReSoil capsules contain a precisely formulated mix of:

- Arbuscular Mycorrhizal Fungi (AMF): Facilitates plant root colonization for nutrient and water absorption.
- Plant-Growth Promoting Rhizobacteria (PGPR): Including Bacillus subtilis and Pseudomonas fluorescens, enhancing plant growth and health.
- Trichoderma spp.: Natural pathogen control, improving plant resilience.
- Organic Bio-stimulants: Seaweed extracts and humic acids, boosting microbial and plant vitality.

Each capsule is composed of agar-agar, a natural, biodegradable polymer offering safe storage, precise microbial delivery, and easy application. ReSoil capsules completely dissolve in moist soil, providing targeted microbial colonization directly at the plant roots.

How ReSoil Works

The capsules ensure a simple, three-step application:

1. Place a capsule next to the plant root during planting.
2. Lightly cover it with soil.
3. Maintain soil moisture for activation.

Once activated, the microbial ecosystem rapidly colonizes plant roots, enhancing nutrient absorption, water retention, plant immunity, and soil fertility.

Unique Advantages

Environmental Responsibility: 100% biodegradable and free of synthetic chemicals.

Ease of Use: No measuring, mixing, or specialized equipment.

Cost-Effective: Low unit production cost ensures affordability. Long-Term Sustainability: Provides lasting improvements to soil health and productivity.

Target Market and Segmentation

ReSoil is designed for:

- Municipalities and NGOs focusing on urban greening and environmental remediation.
- Organic farmers and sustainable agriculture producers.
- Eco-conscious gardening communities and landscaping enterprises.
- Controlled-environment agriculture (CEA) such as greenhouses.

Competitive Edge

ReSoil stands out from current market alternatives (e.g., Mykoriza Premium, Dynomyco) due to:

- Superior ease of use and precision in microbial delivery.
- Eco-friendly packaging and absence of plastics.
- Enhanced affordability and scalability.

Adaptability to diverse soil and climate conditions.

Business Model

Channels:

Direct B2B (municipalities, NGOs, agricultural co-ops).

Garden centers, eco-retailers, e-commerce platforms.

Subscription models for regular users.

Revenue Streams:

- 

Retail sales: €9.90 (10 capsules), €25.00 (30 capsules).

Bulk orders: starting from €0.60 per capsule.

Pilot and training kits for educational and demonstration purposes.

Customer Relationships:

Comprehensive user support via educational materials, webinars, and customer engagement programs.

Loyalty initiatives to maintain long-term customer relations.

Detailed Financial Projections

Production Costs (per capsule): Ingredients & Capsule

- Material: €0.05
- Labour & Operational Expenses: €0.10
- Quality Control & Packaging: €0.13
- Microbial Cultivation: €0.08

Total Estimated Cost: €0.36 per capsule **Projected Gross Margin**: 44%–64% **Revenue Forecast:**

- 6-month projection: €18,500/month
- 1-year projection: €24,000/month
- 5-year projection: €90,000+/month

Initial investment requirement: €50,000

Break-even period: Approximately 8–10 months

The need for hands-on product visibility. He noted that farmers, especially in more conservative or traditional segments, are unlikely to adopt a new soil treatment without seeing real-world results. Visual and measurable impact on soil vitality and plant health is key.

- The economic return must be made clear: Poralo stressed that showcasing the cost-benefit ratio of ReSoil in real conditions (reduced fertilizer use, increased crop resilience, etc.) would be the strongest incentive for stakeholders to switch from familiar methods.
- Regional dealer involvement: He recommended a network of local dealers to manage field testing and act as trusted product ambassadors. These partners would maintain demonstration plots and directly engage with local users.
- Challenges of online-only launches: According to his experience, launching such an innovative product purely online would limit adoption, especially in rural or lower-tech regions. Direct, tangible engagement is essential early on.

As a response, our strategy integrates:

- Public field plots managed with local municipalities in France,
- Technical training sessions for partner cooperatives,
- Early outreach to French agricultural innovation incubators, Use of comparative visuals
- (before/after plots) in future promotions.

This feedback helped us shape our real-world implementation roadmap.

Potential Risks and Mitigation Strategies

Adoption Resistance: Mitigated through demonstration sites, clear communication, and verified economic benefits. Product Moisture Sensitivity: Addressed through sealed, protective packaging and clear user guidelines.

Delayed Visible Results: Handled through transparent communication and realistic user expectations.

Regulatory Compliance: Continuous monitoring of and alignment with evolving EU regulations.

Our packaging is also adapted for product shelf stability and logistics. While our core ingredient (agar-agar) is moisture-sensitive, the capsules are air-dried post-production and sealed in moistureresistant recycled paper tubes — avoiding plastic while maintaining product integrity.

Conclusion

ReSoil represents a practical, scientifically robust, and environmentally conscious solution to restoring soil health across Europe. Our innovation not only addresses immediate environmental concerns but also supports broader ecological and sustainability objectives. Through collaborative efforts and targeted strategies, we aim to significantly impact soil regeneration and sustainability practices.

With scalable production, growing demand, and institutional readiness,

ReSoil is positioned to become a key contributor to regenerative agriculture across the continent.

Together, let's regenerate Europe's soils—one capsule at a time.

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Projet 3.3 Pure Soil Tech

PureSoil Tech: Sustainable Solutions for Modern Agriculture

1. Introduction: A Farmer's Story

Ana, a dedicated farmer in the Netherlands, has cultivated leafy greens for local markets for years, continuing a cherished family tradition. Her commitment has always been to provide fresh, healthy produce while stewarding the land with care. However, with the European Union's increasingly stringent nitrate regulations, Ana faced a significant challenge. She needed a sustainable, future-proof solution to manage her soil responsibly without sacrificing yield or quality. Her research led her

to the AquaSoil Filter from Pure Soil Tech—a groundbreaking, biochar-based system designed to purify polluted irrigation water while simultaneously restoring soil health.

2. The Problem: A Convergence of Agricultural Challenges

Across Europe, farmers grapple with a multifaceted problem: the water they rely on is often contaminated with nitrates, pesticides, and heavy metals. This not only harms crops but also puts farmers at risk of legal and financial penalties for non-compliance with EU environmental regulations. Existing solutions, such as chemical treatments, are frequently too expensive, complex, or ill-suited for agricultural contexts.

2.1. Regulatory Pressures

The EU's Water Framework Directive and the Nitrates Directive impose significant pressure on farmers to reduce their environmental footprint. These regulations are becoming stricter, and failure to comply can lead to substantial fines and operational restrictions. Farmers urgently need affordable, scalable, and sustainable solutions to meet these evolving standards.

2.2. Agrochemical Runoff

Pesticides and herbicides, while essential for crop protection, often seep into the soil and contaminate groundwater and nearby rivers. These chemicals can persist in the

environment for extended periods, harming biodiversity and rendering water sources unsafe for human and animal consumption.

2.3. Nitrate Pollution

The overuse of nitrogen-based fertilizers has led to widespread nitrate leaching into groundwater and surface water, a critical issue across Europe. This contamination not only poses a threat to human health but also causes eutrophication, which severely damages aquatic ecosystems. The Netherlands, with its high livestock density and manure use, has one of the highest nitrogen surpluses in Europe, exacerbating the problem.

2.4. Water Scarcity and Drought

Climate change has introduced a new challenge: increased frequency of droughts, even in traditionally water-abundant regions like the Netherlands. Water shortages make irrigation less efficient, and the problem is compounded when available water sources are polluted, making them more difficult and expensive to treat.

2.5. Soil and Water Salinization

In coastal agricultural areas, rising sea levels and excessive drainage contribute to saltwater intrusion, leading to the salinization of both soil and water. This reduces water quality for irrigation, stresses crops, and degrades soil health over time.

3. The Solution: The AquaSoil Filter

Pure Soil Tech, a Dutch startup founded in 2024, is on a mission to make sustainable farming both possible and practical. We believe that clean water and healthy soil should not be luxuries. That's why we developed the AquaSoil Filter, a unique solution that addresses both water purification and soil regeneration in a single, elegant system.

Our filter, which is placed directly into the soil, utilizes biochar—a natural, carbon-rich material produced from agricultural waste—to filter contaminants from water

while simultaneously revitalizing the soil. It's not just a filtration system; it's a comprehensive solution for sustainable agriculture.

Key Features: - No advanced technical skills needed for installation - Scales easily to different farm sizes - Low carbon footprint through waste biomass utilization - Dual function: NOT JUST FILTRATION. NOT JUST SOIL. WE DO BOTH!

4. The Product: Biochar Production and Application

Our innovative process transforms agricultural waste into a powerful tool for soil and water regeneration.

4.1. The Biochar Production Process

1. **Feedstock Preparation**: The process begins with the collection of chopped wood, which is then dried to reduce its moisture content.

2. **Industrial Pyrolysis**: The dried wood is heated to 350–700°C in a low-oxygen pyrolysis reactor. This thermal decomposition process creates biochar, a lightweight, highly absorbent, carbon-rich solid.
3. **Organic Matter Integration**: The raw biochar is mixed with other organic waste materials, such as nut shells, sawdust, and manure, to enhance its soil-enriching properties.
4. **Post-Processing**: The biochar is then cooled, sieved, and can be "charged" with compost, microbes, or minerals to activate it for optimal performance in the soil.
5. **Application**: Finally, the biochar is evenly spread in the subsoil layer and covered with topsoil, where it enhances soil fertility, moisture retention, and microbial life.

This process is not only effective but also highly sustainable, as it repurposes local waste materials into a high-value product.

5. Business Model: Accessible and Value-Driven

Our business model is designed to be transparent, customer-centric, and aligned with the needs of modern farmers.

5.1. Value Proposition

Regulatory Compliance: Helps farmers meet strict EU regulations. **Affordability**: A cost-effective solution compared to industrial alternatives. **Dual Function**: Filters water and improves soil health simultaneously. **Sustainability**: A low-energy, passive system with a

minimal carbon footprint. **Ease of Use**: Simple to install and maintain.

Durability: A long lifespan of 5–10 years, offering excellent long-term value.

5.2. Customer Segments

Small to medium-sized farmers in the EU.

Agricultural cooperatives.

Agribusinesses requiring regulatory compliance.

Environmentally conscious consumers and organizations.

5.3. Customer Relationships

We are committed to building long-term relationships with our customers through:

After-Sales Service: A free 5-year after-sales service.

Loyalty Programs: Subscription models and loyalty rewards.

Educational Content: Regular newsletters, blog posts, and videos.

Feedback and Involvement: Actively seeking customer feedback for continuous improvement.

6. Market Analysis and Strategy

6.1. Market Size and Strategy

The market for our solution is substantial:

TAM (Total Addressable Market): 50% ≈ 4.8 million hectares of irrigated cropland are affected by pollution

SAM (Serviceable Addressable Market): 65% affected irrigated cropland **SOM (Serviceable Obtainable Market)**: 45% potential market

Target Countries: Netherlands, Belgium, France, Germany, Italy, and Luxembourg

6.2. Marketing Strategy

Our go-to-market strategy is threefold:

1. **Digital Marketing**: Social Media presence and online engagement 2. **Field Marketing**: Participation in agricultural exhibitions

3. **Partnerships**: Collaboration with Farmer Unions, Environmental Consultants, and other key stakeholders

References: European Environment Agency - Water, Eurostat - Agriculture

7. Competitive Landscape

The AquaSoil Filter stands out in the competitive landscape:

Criteria	Pure Soil Tech	Veolia	Pacific Biochar
Target Market	Small to large farmers and companies ✓	Large industrial clients	Broad agricultural, US-based
Price	€1,300/ton ✓	€10,000 + custom systems	€2,000/ton

Installation	DIY and assistance provided ✓	Requires professionals	Manual setup and limited support
Maintenance	Minimal, 5-year warranty ✓	Requires technical service	Seasonal re application
Soil Health Benefit	Yes ✓	No	Yes ✓
Carbon Footprint	Very low, made from waste biomass ✓	Medium to high	Low ✓
Overall Rating for EU Agri Market	**Best fit - practical, affordable** ✓	Too complex and costly	Not water filtration focused

Unlike industrial-scale systems from competitors like Veolia, which can cost upwards of €10,000, our solution is priced at an accessible €1,300 per ton. Furthermore, our system is designed for easy, DIY installation and offers the unique dual benefit of water filtration and soil enhancement.

8. Financial Model

8.1. Pricing Structure

50kg AquaSoil bag: €75 (single payment)

Bulk pricing: €1,300/ton (single payment)

Subscription model: €1,170/ton (€234/year for 5 years)

Installment plan: 4 payments over 4 years (€390/ton annually)

8.2. Revenue Projections

The company projects steady revenue growth from 2024 to 2030, with an 18% profitability margin.

8.3. Funding and Vision

Financial Projections (2026): €1M funding allocation - 35% Operational Expenses - 35% Marketing & Administrative - 20% EBITDA - 10% R&D

Vision for Growth: - Expand Production Capacity - Enter New Markets - Boost Sales & Outreach - Enhance R&D capabilities

9. ESG Commitment

Environmental, Social, and Governance (ESG) principles are at the heart of our operations:

Environmental Impact: - Clean water, soil health, and reduced pollution - Low emission production using waste biomass - Contribution to circular economy principles

Social Responsibility: - Fair working conditions - Education and community engagement - Local community partnerships

Governance Standards: - Clear internal structures - Transparency, ethical sourcing, and data privacy - Compliance with EU regulatory frameworks

10. The Team

Pure Soil Tech was founded by a team of seven passionate and innovative university students who now serve as the company's board members and department heads. Our team of 50 employees in Amsterdam includes scientists, engineers, marketers, and financial analysts, all dedicated to our mission of bringing sustainable, accessible water filtration solutions to the agricultural world.

Our Departments Include: - Research & Development - Marketing - Sales - Operations - Finance

Despite being students, we've created a startup with the energy of a young team, the professionalism of an established company, and a clear mission: to bring sustainable, accessible water filtration solutions to the agricultural world.

This documentation represents the fusion of Pure Soil Tech's comprehensive business plan with visual elements and enhanced details from their presentation materials, providing a complete overview of their innovative AquaSoil Filter technology and business strategy.

Projet 3.4 Arbos

Arbos: Green Metal Recovery with Alyssum Mining

1. Introduction: The Challenge of Industrial Pollution

Industrial activities, while vital for economic growth, have often left a legacy of environmental contamination. Heavy metal pollution from factories, refineries, and mining operations poses severe risks to human health, damages ecosystems, and renders land and groundwater unusable. This devaluation of land not only represents a significant economic loss but also a persistent threat to environmental stability.

What do you see? - Severe health risks - Damaged ecosystem

- Contaminated groundwater - Devaluation of land

Chemicals from factories polluting the soil and groundwater create a cascade of environmental and economic problems that traditional remediation methods struggle to address effectively.

2. The Solution: Alyssum Mining by Arbos

Arbos, with its "Soul for Soil" philosophy, introduces a revolutionary solution: **Alyssum Mining**. This innovative green technology leverages the power of nature to address industrial pollution. By using specific species of Alyssum plants, which are natural hyperaccumulators of heavy metals, Arbos can extract valuable metals like nickel directly from contaminated or low-grade soils.

What Makes Alyssum Special?

Transforms polluted land into fertile soil: These remarkable plants

can rehabilitate contaminated areas

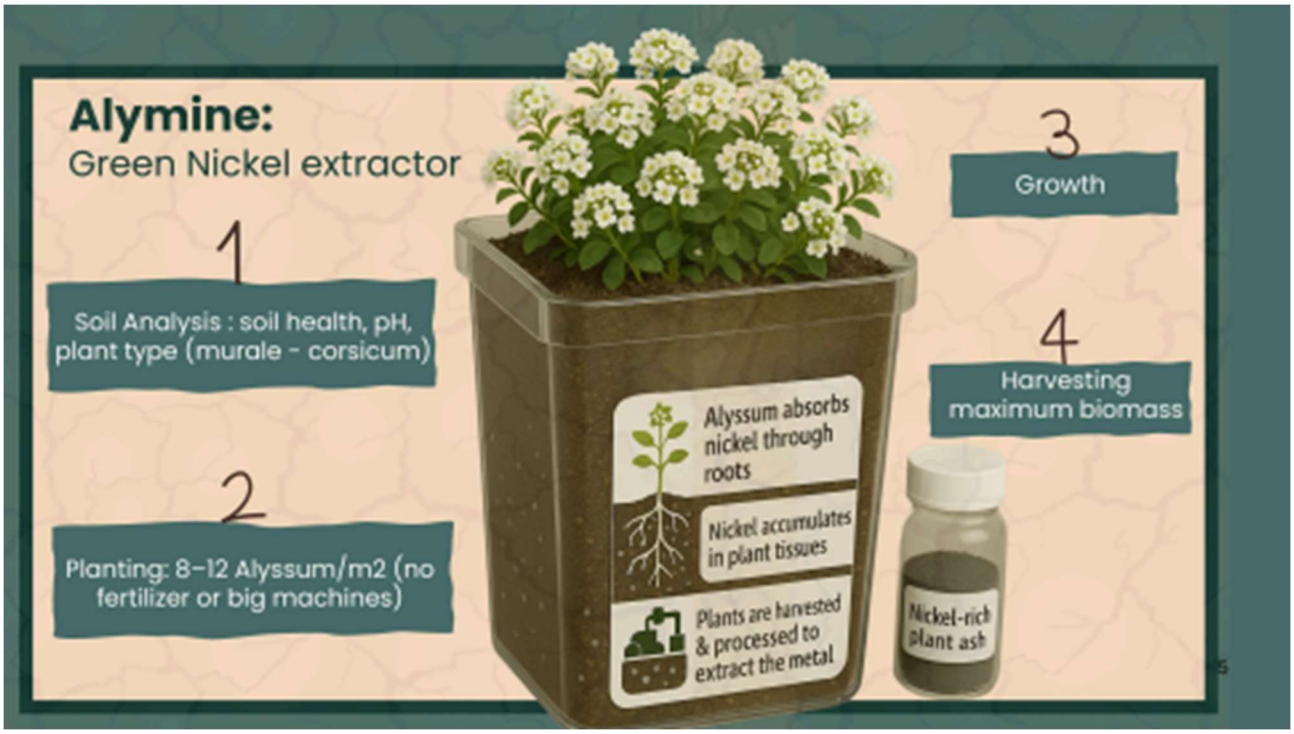
Absorbs up to 3% nickel (30,000 mg/kg) in leaves and stems through natural hyperaccumulation

Dual revenue streams with low capital investment: Generates income from both remediation and metal recovery

High return potential: Offers attractive financial returns for investors and landowners

Supports ESG goals: Enables carbon credits, green tech certifications, and circular economy initiatives

3. The Alymine Process: A Step-by-Step Guide



Arbos has developed a systematic process called **Alymine** to ensure efficient and

effective green nickel extraction:

Step 1: Soil Analysis

Assess soil health, pH levels, and metal concentrations

Determine optimal plant type (murale vs corsicum species)

Evaluate site conditions for maximum efficiency

Step 2: Planting

Plant 8–12 Alyssum plants per square meter

No fertilizer or heavy machinery required

Minimal environmental disruption during installation

Step 3: Growth

Plants naturally absorb nickel through their root systems

Alyssum absorbs nickel through roots and accumulates it in plant

tissues Monitoring growth and metal accumulation levels

Step 4: Harvesting

Harvest at maximum biomass when nickel concentration peaks

Plants are harvested and processed to extract the metal

Step 5: Processing

Nickel-rich plant ash is produced for metal extraction

High-value nickel recovery for commercial use

4. Metal Extraction: From Biomass to Bricks

After harvesting, the nickel-rich biomass is processed in partnership with specialized facilities to recover the metal through a three-step process:

Step 1: Biomass Incineration

- Dried plants are burned at 500–700°C
- Reduces biomass to concentrated metal-rich ash

Step 2: Nickel Extraction

- Hydrometallurgical processes extract nickel from ash
- Up to 95% recovery efficiency achieved

Step 3: Refining and Shaping

- Recovered nickel is refined into commercial-grade bricks
- Ready for sale to industrial markets

5. Business Model: Flexible and Profitable

Arbos offers a flexible business model tailored to the specific conditions of each site, maximizing value for all stakeholders.

5.1. Standard Service (Nickel Yield < 200 kg/ha)

For sites with lower nickel concentrations, Arbos offers a comprehensive fixed-price remediation service:

- **Fixed Price**: €9,000 per hectare

Services Included:

Comprehensive soil testing and analysis

Professional planting and plant care

Complete harvesting operations

Detailed ESG impact report

Financial Performance:

Revenue: €9,000 per hectare

Costs: €5,200 per hectare

Gross Profit: €3,800 per hectare

Gross Profit Margin: 42%

Break-even point: 133 kg of nickel

5.2. Shared Revenue Model (Nickel Yield ≥ 200 kg/ha)

For sites with higher nickel yields, Arbos implements a shared revenue model that benefits all stakeholders:

Activation Trigger: When nickel yield reaches 200 kg per hectare or more **Processing Partnership**: Biomass sent to specialized processing partner

Revenue Distribution:

50% to processing partner (for extraction and refining)

50% to Alymine operations

Of Alymine's share: 20% to landowner (client), 80% retained by Arbos

This model ensures that higher-value sites generate proportionally higher returns for

both Arbos and the landowner.

6. Market and Customer Segments

Arbos targets a diverse range of clients across three main categories:

6.1. Industrial Sites (B2B)

- Former factories requiring environmental remediation
- Decommissioned refineries with metal contamination
- Abandoned mining areas needing restoration
- Industrial facilities seeking ESG compliance

6.2. Landowners (B2C)

- Individual property owners with contaminated land
- Private entities seeking land value restoration
- Agricultural landowners with metal pollution issues
- Real estate developers requiring site preparation

6.3. Government & Public Institutions (B2G)

- Municipal authorities managing contaminated public land
- Environmental agencies overseeing remediation projects
- Public institutions with regulatory compliance requirements
- Government bodies promoting sustainable development

7. Key Partnerships and Ecosystem

Arbos has established strategic partnerships across the value chain to ensure comprehensive service delivery:

Metal Processing Partners

Eramet (France): Leading nickel processing and refining

Nickel Mining Company (France): Specialized metal extraction services

Testing and Monitoring Partners

AGROLAB France SARL: Comprehensive soil testing and analysis

SGS France: International testing, inspection, and certification

Government and Regulatory Partners

Municipalities: Local government collaboration for public projects

Environmental Agencies: Regulatory compliance and oversight support

Seed and Agricultural Partners

Graines Voltz (France): Specialized Alyssum seed supply

Muller Seeds (Netherlands): Regional seed distribution and support

8. Competitive Advantage Analysis

Alyssum Mining offers significant advantages over traditional remediation methods across multiple criteria:

Method	Avg. Cost/ha	Profitability	Timeline	Environmental Impact	Carbon Credit Eligibility	ESG Value
Alyssum Mining	**€9k - €15k**	**High ☑**	**6-12 months**	**Very Positive ♻**	**High Potential**	**Very High**
Excavation & Disposal	€20k - €25k	Low ❌	6-18 months	Disruptive & Costly	Not Eligible	Low
Chemical Soil Washing	€15k - €40k	Unprofitable ❌	3-6 months	Unsuitable for Reuse	Rarely Eligible	None
Bioremediation (Microbes)	€10k - €25k	Low ✔	3-19 years	Moderate ♻	Not Directly	Moderate

Key Advantages of Alyssum Mining: - **Most cost-effective** solution in the market - **Fastest timeline** for meaningful results - **Only method** that generates positive environmental impact - **Highest ESG value** for corporate sustainability goals - **Strong potential** for carbon credit generation

9. Marketing Strategy and Target Persona

9.1. Comprehensive Marketing Approach

Government and NGO Engagement: - Partner with environmental NGOs for contaminated land remediation advocacy - Collaborate with government agencies on public remediation projects

Industry Outreach: - Target companies in electric vehicle, battery, and renewable energy sectors - Participate in industry conferences and networking events

Content and Education Marketing: - Publish detailed case studies highlighting successful remediation projects - Create and distribute press kits to environmental and industry journalists - Organize workshops and masterclasses showcasing Alyssum Mining benefits - Host networking conferences with potential industrial partners

Digital Presence: - Develop comprehensive website with client testimonials and project documentation - Create visual and informative content for social media platforms - Maintain active presence on professional networks

9.2. Target Customer Persona: David Cole

Demographics: - **Name**: David Cole - **Age**: 55 years old - **Position**: CEO of Electric Car Company - **Location**: Germany - **Annual Income**: €100,000 - **Education**: Master's in Environmental Engineering

Professional Interests: - Passionate about sustainable automotive technologies - Active in professional networks and green automotive conferences - Focused on electric vehicle innovations and environmental compliance

Goals and Motivations: - **Regulatory Compliance**: Ensure electric vehicle operations meet strict environmental regulations - **Cost Optimization**: Find cost-effective methods, especially for battery production processes - **Brand Enhancement**: Adopt efficient production methods and minimize resource waste - **Sustainability Leadership**: Enhance company's green image and achieve ambitious sustainability goals

10. The Arbos Leadership Team

Arbos is led by a dynamic team of seven dedicated professionals, each bringing

specialized expertise to their respective departments:

Farah: Chief Executive Officer - Strategic leadership and vision

Umai: VP of Research & Development - Scientific innovation and technology development

Sophia: Chief Operating Officer - Operational excellence and process optimization **Jana**: Chief Financial Officer - Financial strategy and performance management

Iulia: VP of Business Development - Partnership development and market expansion

Aizirek: Chief Technology Officer - Technical innovation and system development

Catalina: Head of Marketing and Sales - Market positioning and customer acquisition

11. Financial Projections and Growth Strategy

11.1. Short-Term Goals (1–2 years)

Market Expansion: €1M investment - Expand operations to 5 EU regions - Establish comprehensive market presence

Infrastructure Development: €1M investment
- Build dedicated planting and harvesting sites - Develop operational capacity for scale

Research and Development: €500K investment - Advanced soil and plant matching research - Optimization of extraction processes

11.2. Mid/Long-Term Goals (3–7 years)

Industrial Infrastructure: €1.5M investment - Develop dedicated nickel refining facility - Achieve vertical integration of the value chain

Agricultural Program: €350K investment - Launch comprehensive Alyssum seed program - Ensure sustainable supply chain

11.3. Projected Impact and Returns

Operational Targets: - **Land Remediation**: Clean over 1,000 hectares of polluted land - **Metal Production**: Produce over 200 tonnes of nickel annually - **Market Leadership**: Become the EU leader in green nickel production

Financial Outlook: - **Annual Revenue**: €3.7–4M per year at full capacity - **Break-even Timeline**: 1–2 years from major investment - **Long-term ROI**: 6–8x return over 10-year period

12. Environmental and Social Impact

12.1. Environmental Benefits

Land Transformation: Converts polluted, unproductive land back into fertile, usable soil suitable for agriculture or development.

Carbon Sequestration: Alyssum plants capture and store carbon during their growth cycle, contributing to climate change mitigation efforts.

Ecosystem Restoration: Gradual restoration of damaged environments, supporting biodiversity recovery and ecological balance.

Sustainable Mining: Provides an environmentally friendly alternative to traditional destructive mining methods.

12.2. Social and Economic Impact

Community Health: Reduces health risks associated with heavy metal contamination in local communities.

Economic Revitalization: Transforms worthless contaminated land into valuable, productive assets.

Job Creation: Generates employment opportunities in environmental restoration and green technology sectors.

Knowledge Transfer: Develops expertise and best practices that can be applied globally to similar environmental challenges.

Conclusion

Arbos represents a paradigm shift in environmental remediation, transforming the traditional cost-center approach to contamination cleanup into a profitable, sustainable business model. Through the innovative Alyssum Mining process, we are not just cleaning up the planet—we are creating a new industry at the intersection of biotechnology, environmental restoration, and sustainable resource recovery.

Our approach demonstrates that environmental responsibility and economic viability are not mutually exclusive but can be synergistic forces driving innovation and positive change. As we scale our operations across Europe and beyond, Arbos is positioned to become a leader in the emerging green economy, proving that nature-based solutions can address some of our most pressing environmental challenges while generating sustainable returns for all stakeholders.

This documentation represents the comprehensive integration of Arbos's business strategy with detailed visual elements and enhanced information from their

presentation

materials, providing a complete overview of their revolutionary Alyssum Mining technology and market approach.