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Novel Biotechnological Solutions in Climate Change Mitigation
2024-1-EL01-KA220-HED-000251373

LT TA Organisation and Evaluation Report

1. Activity Overview

- **Project Title**

Novel Biotechnological Solutions in Climate Change Mitigation (BIOSHIELD)

- **Activity Type**

WP4 - Online LTTA Pre-Piloting Training

- **Leading Organisation**

University of Maribor (UM)

- **Target Group**

Proposed: 50 students (10 per partner) and 5 lecturers (1 per partner)

In the LTTA activity 89 students participated in total, including the ones who attended at least 1 day. Out of 89, 19 students attended the LTTA regularly for 5 days, 50 students attended the LTTA for at least 4 days, and 68 students participated in the LTTA at least for 3 days. The partnership agreed to consider at least 3 days of participation as eligible for certificate issuance, though it was indicated in the project proposal 70% attendance whose rate mathematically requires 3.5 days of participation. However, all the LTTA training was recorded and video records were shared with the students to follow the training delivery in case they couldn't participate. So, 3 days of participation was deemed eligible.

- **Methodology**

Online learning, lectures, case studies, and group presentations over 5 days. Student Evaluations through satisfaction survey including open ended questions that will be used in replacement of student diaries.

- **Process**

The first day, Prof Dr Yiannis Kourkoutas made an opening speech. Prof Dr Kemal Melih Şahin introduced the activity and Assoc. Prof Dr Hudson Ashrafi gave a lecture about Climate Change and Disasters' Effect on Agricultural Productivity, Blueberry as a Case Study. Then question and answer session followed and students asked their questions.

The second day started under the moderatorship of Prof Dr Yiannis Kourkoutas and Assist Prof Dr Dunja Samec introduced Dr Erna Karalija (University of Sarajevo) to give a lecture about Phytoremediation. After the lecture, Q&A session continued.

The third day, Assist Prof Dr Vasiliki Kachrimanidou gave a lecture about Industrial biotechnology, followed by the Q&A session. The fourth day, Assoc Prof Dr Silva Grobelnik Mlakar gave a lecture about Microbial Biotechnology in soil-plant systems, followed by the Q&A session.

The final day of the LTTA, the student groups from partner universities presented innovative applications in biotechnology to mitigate the climate crisis.

[Hackathon Programme](#)

2. Student Satisfaction Survey Analysis

A. Participant Demographics and Focus Areas - Canakkale Onsekiz Mart University

The following table summarises the distribution of participants across academic years and their primary biotechnological focus areas as defined in the training questionnaire.

Table 1: Participant Profile Summary

Category	Metric	Total (N=27)	Percentage (%)
Academic Year	1st Year	0	0%
	2nd Year	0	0%
	3rd Year	0	0%
	4th Year	27 (participated) 17 (completed survey)	63%
	Graduate (MSc or PhD)	0	0%
LTTA Focus Area	Climate Change Mitigation	5	
	Mitigation of Disaster Effects	1	
	Plant Biotechnology	4	
	Microbial Biotechnology in Soil-Plant Systems	6	
	Industrial Biotechnology	1	
	Other		

B. Statistical Analysis of Participant Feedback

This section presents the mean scores for quantitative feedback based on the 1-5 agreement scale (1 = Strongly Disagree, 5 = Strongly Agree).

Table 2: Feedback on Training Effectiveness and Career Aspirations

Survey Question	Mean Score (1-5)	Achievement % (Strongly Disagree - 1/ Disagree - 2 /Neutral - 3 /Agree - 4 /Strongly Agree - 5)
Preparedness: Training made me feel more prepared for the actual pilot course.	4	17.65 % (2) 11.76 % (3) 23.53 % (4) 47.06 % (5)
Entrepreneurship: Considering starting a biotech startup or initiative.	3.12	11.76 % (1) 29.41 % (2)

		23.53 % (3) 5.88 % (4) 29.41 % (5)
Industry Preference: Prefer to work in biotech industry (public/private).	3.8	11.76 % (2) 35.29 % (3) 17.65 % (4) 35.29 % (5)
Satisfaction: Overall LTTA organisation met expectations.	4.1	17.6 % (2) 11.8 % (3) 17.6 % (4) 52.9 % (5)

C. Learning Attainments and Theoretical Insights

This section summarises the "Key Learning Attainments" reported by students, focusing on new concepts encountered during the 5-day session.

- **New Concepts Learned:**

- Students reported a significant expansion in their theoretical and technical repertoire, particularly regarding the integration of microbial biotechnology into sustainable ecosystems. A primary takeaway was the shift from single-strain applications to microbial consortia, with participants recognizing their superior efficacy under environmental stressors like drought. Methodological Innovation: Participants highlighted "seed priming" and metagenomics as critical new areas of interest, providing them with the tools to analyze soil microbial communities and improve plant growth-promoting traits. Regulatory and Industrial Frameworks: The introduction of Technology Readiness Levels (TRLs), risk assessment, and the transition from laboratory research to piloting/market-oriented applications filled a crucial knowledge gap regarding how innovation moves through the value chain.

- **Most Inspiring Aspect:**

- * The most interesting aspect was learning how theoretical concepts are translated into practical, research-based applications within the BIOSHIELD framework, including seeing the variety of solutions being produced for different problems and understanding how scientific research is adapted to meet industrial needs through real case studies. Several respondents found inspiration in microbial solutions, specifically how beneficial microorganisms can improve plant growth and soil quality naturally, reduce chemical fertilizer use, help plants survive stress conditions (like drought/poor soil), and simultaneously enhance agricultural productivity and contribute to climate change mitigation. Key topics cited as interesting included the research of blueberries, the disruption of the blueberry's biological clock by climate change, seed priming, the plant that absorbs chromium from the ground, and biodegradable plastic alternatives. The opportunity to explore how the topic is approached in different countries was interesting and inspiring, along with seeing scientists and professors from around the world searching for innovative knowledge and noting their mutual interests across different topics. A surprising and interesting element was the use of environmental

factors to change epigenetic factors and create cold-resistant plants.

- **Career Impact:**

- * The LTTA solidified participants' motivation to pursue paths combining scientific research with entrepreneurial thinking and real-world impact, leading some to plan master's studies in biotechnology, focus more on biotechnologies for drought resistance, or increase interest in agricultural or microbial biotechnology and sustainable, bio-based solutions. Participants gained a new perspective, particularly regarding climate change, and while the LTTA did not change everyone's original career plans, it provided new ideas and a greater focus on innovation, research-driven decision-making, and interdisciplinary collaboration. Participants reported increased awareness of entrepreneurship in biotechnology, a realization that working in an international environment could be suitable for them, and an increase in personal confidence. The training helped participants explore different fields instead of focusing on just one, leading to an evolution in project design perspective by adding new requirements for both experimental and practical designs. A minority of respondents stated that the LTTA did not change much or anything regarding their future career or entrepreneurship plans.

D. Identified Challenges and Obstacles

Participants were asked to identify major obstacles in the lecture topics or challenges encountered during the online activities.

- **Reported Challenges:**

- Multiple respondents found the academic terminology, technical vocabulary, and complex theoretical concepts challenging, specifically mentioning difficulties interpreting interdisciplinary terminology, assessing evidence, and understanding complex interactions between soil microbes, plants, and environmental factors. Core difficulties included the complexity of genetic engineering, ensuring heritability, and understanding the regulatory requirements and processes for scaling up laboratory work to pilot and industrial levels. Major challenges discussed were the rapid pace of global climate change, resulting stress on plants and crops, current environmental challenges, sudden temperature changes, and increases in heavy metal content in soil. Some respondents faced challenges with presentation clarity, suggesting the need for more figures/diagrams/charts. Other issues included internet connection problems and the inefficient process of having to wait for a new invite link for each meeting. Other reported obstacles included industrial hardships, unpredictability, high costs, legal rules, public trust issues, and field challenges such as environmental stress and lab issues like sterilization problems.

- **Mitigation Strategy for Piloting:**

- To mitigate the issues identified by students during the piloting phase, the following strategies will be implemented. Students reported that academic and interdisciplinary terminology was a significant barrier; therefore, future sessions will utilize pre-distributed technical glossaries and a higher density

of visual infographics to clarify complex soil-plant-microbe interactions. Regarding the difficulties in scaling laboratory results to industrial levels, the program will provide structured Technology Readiness Level (TRL) roadmaps and regulatory compliance checklists to simplify the transition from lab to market. To address the environmental stressors and climate variability noted in the feedback, standardized digital operating procedures and adaptive research designs will be developed to ensure operational continuity under fluctuating field conditions. Furthermore, the perceived operational and cost-related barriers will be mitigated through the introduction of basic economic modeling modules and risk assessment workshops. Finally, to eliminate the logistical frustrations reported by participants, all learning materials and live sessions will be consolidated into a single centralized learning management platform, moving away from session-specific invite links to ensure seamless access and provide asynchronous learning opportunities for those with connectivity issues. This streamlined approach focuses on removing technical and operational friction to enhance the overall impact and scalability of the pilot activities.

E. Transversal Skills Application

In accordance with the project's goal to connect data with transversal skills, participants identified specific skills they consciously applied during the training.

Table 3: Application of Transversal Skills

Skill Identified	Frequency of Mention	Specific Examples
Entrepreneurial Thinking	1/17	Students mentioned focusing on reducing overall production costs (using waste products like OMW) and strategizing to gain financial/institutional support from the government and oil-producing companies.
Critical Thinking	13/17	Students mentioned analyzing theoretical foundations during lectures, questioning assumptions, comparing different scientific methodologies, and integrating new information into their own expertise (e.g., agricultural productivity).

Problem-Solving	7/17	Students mentioned suggesting suitable microbial solutions for real agricultural problems, evaluating the feasibility of approaches, and developing practical fixes inspired by theoretical knowledge when facing challenges.
Effective Communication	9/17	Students referred to clearly expressing ideas during discussions, actively listening to synthesize different opinions, maintaining constant contact via digital tools (e.g., WhatsApp), and successfully presenting their projects verbally.
Teamwork	8/17	Students noted balancing project responsibilities based on individual skills, covering for absent members during emergencies, brainstorming collaboratively, and cooperating efficiently under limited time constraints for hackathons.
Other 1: Leadership & Coordination	3/17	Students mentioned acting as team leaders, taking initiative to coordinate members constantly, and ensuring that research topics and responsibilities were distributed evenly.

F. Indicators of Achievement

- **Attendance Rate:** (Requirement: 70% for certification, determined for at least 3 days of participation).

- **Certification:** Twenty seven (27) students successfully attended the LTTA, which equals to 100% attendance rate

G. Conclusion and Recommendations

The LTTA was highly successful in meeting the specific objective of enabling students to feel ready to generate creative biotechnological ideas for the mitigation of climate change impacts. This outcome is strongly supported by the activity on the final day, which culminated in student groups presenting innovative applications designed to address the climate crisis, demonstrating practical readiness. Qualitative feedback further highlights this achievement, as participants reported that the most inspiring aspect was learning how theoretical concepts are translated into practical, research-based solutions within the BIOSHIELD framework, which expanded their perspective on real-world problem-solving. The training successfully fostered essential transversal skills necessary for innovation and idea generation, including the application of Critical Thinking, Problem-Solving (such as suggesting suitable microbial solutions for agricultural issues), and Entrepreneurial Thinking (focusing on cost reduction and institutional support). Collectively, the LTTA solidified participants' motivation and capacity to combine scientific research with an entrepreneurial mindset, thereby achieving the goal of preparing them to creatively address climate change mitigation.

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Date: 15/05/2026

Verification: [Attendance Sheets](#)
[Screenshots](#)

Appendix 1

List of 68 Qualifying Participants by University (Participated at least 3 days or more)

Democritus University of Thrace (DUTH)

1. Vasiliki Bouladaki: 5 days (Days 1, 2, 3, 4, and Hackathon)
2. Glykeria Psarra: 4 days (Days 1, 2, 3, and Hackathon)
3. Katerina Tounta (Aikaterini Paraskevi Tounta): 3 days (Days 1, 4, and Hackathon)
4. Anastasia Karvouni: 3 days (Days 1, 3, and Hackathon)
5. Aspasia Riga: 3 days (Days 1, 4, and Hackathon)
6. Spyridoula Papadopoulou: 3 days (Days 1, 2, and 4)

Çanakkale Onsekiz Mart University (ÇOMÜ)

1. Akikat Dimagambetov: 5 days (Days 1, 2, 3, 4, and Hackathon)
2. Ayşe Öncüler: 5 days (Days 1, 2, 3, 4, and Hackathon)
3. Berk Çelikel: 5 days (Days 1, 2, 3, 4, and Hackathon)
4. Ecem Arslan: 5 days (Days 1, 2, 3, 4, and Hackathon)
5. Eftelya Nergis Özbiçerler: 5 days (Days 1, 2, 3, 4, and Hackathon)
6. Esmâ Zehra Sağlam: 5 days (Days 1, 2, 3, 4, and Hackathon)
7. Ezgi Coşkun: 5 days (Days 1, 2, 3, 4, and Hackathon)
8. Melis Buse Uslu: 5 days (Days 1, 2, 3, 4, and Hackathon)
9. Melis Köleoğulları: 5 days (Days 1, 2, 3, 4, and Hackathon)
10. Altuğ Dirim (Altuğ Didim): 4 days (Days 1, 3, 4, and Hackathon)
11. Asya İrem Kayış: 4 days (Days 2, 3, 4, and Hackathon)
12. Ayşe Ayzıt Bekirhan: 4 days (Days 1, 2, 3, and 4)
13. Ceren Şevval Yıldız: 4 days (Days 1, 2, 3, and 4)
14. Ecem Dilay Demirkalp: 4 days (Days 1, 3, 4, and Hackathon)
15. Eray Ekrem: 4 days (Days 1, 2, 3, and Hackathon)
16. Eylül Türkmen: 4 days (Days 1, 2, 3, and Hackathon)
17. Hiranur Başak: 4 days (Days 1, 2, 3, and Hackathon)
18. Nurten Coşkun: 4 days (Days 2, 3, 4, and Hackathon)
19. Zülal Hoş: 4 days (Days 1, 3, 4, and Hackathon)
20. Cansu Demirboğa: 3 days (Days 1, 2, and Hackathon)
21. Didem Durmuş: 3 days (Days 1, 3, and Hackathon)
22. Emek Can: 3 days (Days 1, 2, and 4)
23. Melike Güneş: 3 days (Days 1, 2, and 4)
24. Mert Doğrucu: 3 days (Days 1, 2, and 4)
25. Muhammed Emir Karagöz: 3 days (Days 1, 3, and 4)
26. Ranya Demir: 3 days (Days 1, 3, and 4)
27. Zübeyde Gökteke: 3 days (Days 1, 3, and 4)

Ionian University (IU)

1. Andriana Argyrakou: 5 days (Days 1, 2, 3, 4, and Hackathon)
2. Eleftheria Michou: 5 days (Days 1, 2, 3, 4, and Hackathon)
3. Konstantina Voukelatou: 5 days (Days 1, 2, 3, 4, and Hackathon)
4. Lydia Epitropaki: 5 days (Days 1, 2, 3, 4, and Hackathon)
5. Maria Gkouzou: 5 days (Days 1, 2, 3, 4, and Hackathon)
6. Maria Martini: 5 days (Days 1, 2, 3, 4, and Hackathon)
7. Panagiota Skoufa (Skoufa Panagiwta): 5 days (Days 1, 2, 3, 4, and Hackathon)
8. Georgia Konstantina Tsami: 4 days (Days 1, 3, 4, and Hackathon)
9. Maria Serafeimidi (Maria Serafimeidi): 4 days (Days 1, 2, 3, and Hackathon)
10. Maria-Epistimi Kanaki (Maria Epistimi Kanaki): 4 days (Days 1, 3, 4, and Hackathon)
11. Michael Koumianos (Mike Koumianos): 4 days (Days 1, 2, 3, and Hackathon)
12. Argiro Avgoustidou: 3 days (Days 1, 3, and 4)
13. Regina Evliatou (Reggina Eylliatou): 3 days (Days 1, 4, and Hackathon)

Univerza v Mariboru (UM)

1. Jovana Jevtić: 5 days (Days 1, 2, 3, 4, and Hackathon)
2. Matjaž Muršec: 5 days (Days 1, 2, 3, 4, and Hackathon)
3. Milica Marković: 5 days (Days 1, 2, 3, 4, and Hackathon)
4. Irina Mozhginskaya: 4 days (Days 1, 2, 3, and Hackathon)
5. Lara Ribič: 4 days (Days 1, 2, 3, and Hackathon)
6. Nika Hozjan: 4 days (Days 1, 2, 3, and Hackathon)
7. Hana Skrbinšek: 3 days (Days 1, 4, and Hackathon)
8. Mojca Duh: 3 days (Days 1, 3, and Hackathon)
9. Til Trinkaus: 3 days (Days 1, 3, and Hackathon)
10. Vid Švab: 3 days (Days 1, 3, and Hackathon)

University North (UNIN)

1. Bojana Đurašević 4 days (Days 1, 2, 3, and Hackathon)
2. Ema Zavrtnik 4 days (Days 1, 2, 3, and Hackathon)
3. Gabriela Berić 4 days (Days 1, 2, 3, and Hackathon)
4. Inka Jakupec 4 days (Days 1, 2, 3, and Hackathon)
5. Iva Škrlec 4 days (Days 1, 2, 3, and Hackathon)
6. Jana Iličić (Jana Iličič) 4 days (Days 1, 2, 3, and Hackathon)
7. Lara Bosanac 4 days (Days 1, 2, 3, and Hackathon)
8. Maja Crljenica 4 days (Days 1, 2, 3, and Hackathon)
9. Martina Blažun 4 days (Days 1, 2, 3, and Hackathon)
10. Mia Nardić 4 days (Days 1, 2, 3, and Hackathon)
11. Michaela Zrnić (Michael Zrnić) 4 days (Days 1, 2, 3, and Hackathon)
12. Paula Vidoša 4 days (Days 1, 2, 3, and Hackathon)

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