FUTUREbio

Project Dissemination Report

Project Acronym:	FutureBio
Project full title:	Let's use biodegradable plastic for the future
Project No.:	2021-1-TR01-KA220-HED-000032160
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Version	Date	Author (Partner/Person)	The revision reason
0.1	21.02.2024	Arzum IŞITAN (PAU)	Final form of the report

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1. Introduction

FutureBio was a two-year KA220-HED-Cooperation Partnerships in Higher Education project supported by Turkish National Agency, on biopolymers between nine partners from Turkey and EU. The FutureBio project has provided information about bioplastics and production methods and carried out awareness studies with new innovative training materials is the first project in the field.

FutureBio has five work packages/phases categorized into four management levels for the purpose of to benefit from innovative practices among university students, academic staff, industry workers and the society, and to increase the competencies of academics and students with on-site training:

- Management Level- Phase1: Management
- Operation Level- Phase2 and Phase3: Curriculum preparation including needs analysis, company visits and survey applications, report preparation; creation of interactive open-access education modules, lecture guidebook, and VR exercises.
- Dissemination Level- Phase 4: Dissemination and sustainable implementation of the products
- Monitoring and Control Level- Phase5: Quality Control and Monitoring

The document encompasses:

- External Communication Plan
  - Communication strategy
  - FutureBio key messages
  - Target groups
  - Dissemination tools and channels
- B. Internal Communication Plan
  - Internal Communication procedures
  - Rules and recommendations for a correct use of external communication tools
  - Working internal templates
- C. Evaluation and monitoring of FutureBio dissemination activities
- D. Obligations and requirements for communication actions

WP4 "Dissemination and sustainable implementation of the products" was the framework of the project where all the materials to be used from project results to dissemination activities will be planned and checked during the entire project. The main purpose of this FutureBio Project Dissemination and Communication Plan (PDCP) was to create a common understanding of introducing, transferring, explaining, and using obtained project results during the project duration. The plan has also included determining how to make internal and external communication and interaction within the project consortium and stakeholders and target groups. The intended audience of this document was all project stakeholders including the project team members, university teachers and students, industrial institutions and their workers, high school students and teachers, public and private institutions, associations, individuals, general society.

FutureBio's dissemination activities aimed at communicating its objectives and results to a wide audience by promoting the adoption of project's results, as well as by facilitating the exchange of information and the interaction with industry, academia, and society as a whole.

Dissemination materials, activities, the number of people to reach, and their expected impact are the following:

- Website was set up in all partner languages and constantly updated.
- 8 webinars as alive were organized through the project YouTube account. Other broadcasts, including congress presentations, have also been added to the YouTube channel.
- Establishment of social media platforms were made by PAU.
- Newsletters were prepared every six months.
- 7 National Informative Meetings and 1 Workshop/Panel (E1-E8) were organized.
- Announcement of the activities was performed on local and national platforms. The results of the FutureBio project were presented in relevant seminars/conferences, and news.
- Some review and research papers were published in highly ranked international journals.
- FutureBio consortium has been formed between competent institutions in the scientific and technological fields. Dozens of congresses are organized or attended by our partners every year. Within the participation in various conferences/seminars, we distributed approx. 1000 leaflet by PAU and all partners, and via website, social media, press/media we reached over the 20000 people (For example, the news on the PAU official twitter page for the C2 (student training) activity of the project, received 1,494 views (https://twitter.com/pauedutr/status/1724700933508989235), and a Linkedin post about the C2 activity received 2485 views (https://www.linkedin.com/feed/update/urn:li:activity:7129262393120948224/).
- Project partners have attended various congress/symposium related for the BDPs.
- Two master theses have been completed in the context of the FutureBio.
- A patent application was filed for one of the ideas developed by the PAU team within the scope of the FutureBio project. This patent idea was awarded a silver medal at ISIF2023.
- The PAU team participated in Teknofest 2022 and Teknofest 2023 with the ideas developed by the FutureBio project. In both years, the project made it to the finals in the Environment and Energy and Technologies for the Benefit of Humanity / Disaster categories. In Teknofest 2022, the best presentation award was won. a patent application was made for one of these ideas.
- Within the scope of TÜBİTAK 2209-A University Students Research Projects Support Program, student projects on the use of bioplastics were supported in 2022 and 2023 under the supervision of FutureBio PAU team.
- FutureBio's main target group was the university students and academicians. With the dissemination activities, additionally it was made known to industry, high school students, and society using visual and printed materials, website, social media, webinars, and informative meetings.
- At least 285 people attended national informative meetings. People who work on polymer and its production from the public and private sector and Municipality were invited. We reached 600 people with those activities directly.
- FutureBio had a workshop/panel held by KLU. This event has been organized to present all the outcomes of the project. 70 local participants attended this activity including the Vice Governor of Kırklareli.
- Within the scope of the project, the consortium carried out various promotional activities in high schools and secondary schools to increase impact: in high schools and secondary schools,

activities have been organized such as hand-on workshops, art competitions and poster presentations. Earth day STEM challenge activities were organized to reach at least 350 young people with activities at the secondary and high school level, which was held locally in especially Italy, Romania, and Turkey.

- For university students, various activities were organized: a poster competition, one company field trip and hands-on workshops were organized by OTH. Social responsibility movements such as collecting plastics etc. were initiated.
- The number of people we directly reached among university students was planned to be 500. With the events organized, press reports, lectures given at university level, and project outputs, we have reached more than this number of university students. Thus, we expect awareness raising efforts to continue locally and across countries.
- One of the expected effects of the project was to combine the theoretical knowledge of universities with industry and to create an environment for joint work. In this context, information was exchanged with PAGEV on many issues.
- Above all, it was expected that educational materials produced using high technology would be met with great interest, especially by Generation Z, and this has happened.
- eTwinnig, Erasmus+ Project Results Platform, and EPALE platforms are used for the dissemination, also.
- Within the dissemination activities for the public, the Layman's Report provided a general and brief overview of the project and its outcomes, such as the challenges faced by the project, the proposed solutions, the innovative aspects of such solutions, the main achievements and outputs, the main results of the implemented pilots or recommendations for future. The Layman's Report was the final dissemination activity within the project's duration. The Layman's report summarizes the work of a LIFE FutureBio project for a general audience. They are a means of extending the impact of the project beyond the area of implementation.
- Beyond all this, the web platform which contains all project outputs, will be kept up to date for at least 5 years by the project team.

- The VR materials created in FutureBio have been published in the Meta Store for VR, and on a webpage for more traditional access. Below are the instructions for accessing the material on both technologies:
    - For VR, the FutureBio 360 materials can be accessed on Meta Quest 2, Meta Vision Pro and Meta Quest 3 goggles through the Meta Store. Someone can install the application on her/his goggles by one of two ways:
        - Either visit the application's Meta Store page on your mobile phone or desktop by visiting the store page and adding the application to her/his account.
        - Or she/he can put on VR headset, go to the Meta Store inside the VR operating system and then search for "FutureBio". The application is released in the Meta App Lab.
    - For desktop and mobile use, the FutureBio 360 materials can be found by visiting the link at: https://ctrl.studio/play/futurebio or by embedding the content using an iframe to any web page.

2. Dissemination Materials and Activities

2.1. Project Logo

For the project logo, PAU, COSVITEC, and CTRL prepared a draft before TPM1, and the project logo was selected during TPM1. After the logo selection, a leaflet as a draft has been prepared by PAU and after the approval of the partners, all project partners translated into languages and used in all promotion and dissemination activities.

2.2. Project Leaflet

After the logo selection, a leaflet as a draft has been prepared by PAU and after the approval of the partners, all project partners translated into languages and used in all promotion and dissemination activities. Those are available through the website.

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Dear Reader,

The first transnational meeting of "Let's use biodegradable plastic for the future (FutureBio)" has been realized on 26th-27th of May 2022 in Denizli, Turkey. FutureBio is a two-year KA220-HED-Cooperation Partnerships in Higher Education project supported by Turkish National Agency, on biopolymers between eleven partners from Turkey and EU.

Pamukkale University (PAU) is the project coordinator, and Kirklareli University (KLU) and Selçuk University (SU) from Turkey, Fondazione Bruno Kessler (FBK), Cosvitec Societa Consortile Arl (COSV), Universita Degli Studi Di Trento (UNITN) and Indivenire srl (IND) from Italy, and Universitatea Technica Cluj Napoca (CNU) from Romania, and CTRL Reality Oy (CTRL) from Finland, and Ostbayerische Technische Hochschule Regensburg (OTHR) from Germany, and University of Applied Sciences of Southern Switzerland (SUPSI) from Switzerland are the project partners.

What are the Plastics and Biodegradable plastics?

Plastics are a wide range of synthetic or semi-synthetic materials that use polymers as a main ingredient. Modern world has met with plastic/polymeric materials for the first time in the 1400s after Columbus encountered a natural rubber ball in Haiti. Today, polymers have found a wide range of applications thanks to their lightness, easy formability, and find a wide range of uses, from kitchenware to artificial heart valves. Many polymers are used in packaging of food, textile, and machinery, and they are important parts of solid waste disposed of in solid waste landfills.

According to the EU reports, PM packaging parts represent about 8% of the overall refuse in the landfills. Besides all, microplastics which are tiny fragments below 5 mm in size, are a big problem for leakage of rivers, lakes, seas and oceans. They can remain intact for many years. Reuse in manufacturing, incineration for energy generation, biodegradation in compost or in soil can be counted as disposal processes for plastic wastes. To reduce all negativities caused by polymers, "A EU Strategy for Plastics in a Circular Economy" and "Plastic Waste: a EU strategy to protect the planet, defend our citizens and empower our industries" has been developed. In the EU, around 25.8 million tons of plastic waste are produced every year. EU reports also states that only 6% of plastic products are demanded in the EU as recycled plastics. Polymeric waste is frightfully increased with 'single-use' plastics each year. Reusability and nature degradable polymer production are important parts of these strategies. According to the European Green Deal Communication, reducing wastes, compensating carbon footprint emissions, saving resources, and sustainability are

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Hyvä lukija,

Projektin "Let's use biodegradable plastic for the future (FutureBio)" ensimmäinen kansainvälinen kokous pidettiin Turkin Denizlissä 26.-27.5.2022. FutureBio on Turkin kansallisen toimiston tukema kaksivuotinen Erasmus+-kumppanuushanke korkeakoulukaselle (KA220-HED-Cooperation Partnerships in Higher Education) biopolymeereistä ja siihen osallistuu 11 kumppania Turkista, EU:sta ja Sveitsistä.

Projektin koordinaattorina toimii Pamukkale University (PAU) Turkista ja projektin muita kumppaneita ovat Selçuk University (SU) ja Kirklareli University (KLU) Turkista, Cosvitec Societa Consortile Arl (COSV), Fondazione Bruno Kessler (FBK), Universitá Degli Studi Di Trento (UNITN) ja Indivenire srl (IND) Italiasta, Universitatea Tehnica Cluj-Napoca (CNU) Romaniasta, CTRL Reality Oy (CTRL) Suomesta, Ostbayerische Technische Hochschule Regensburg (OTHR) Saksasta ja University of Applied Sciences of Southern Switzerland (SUPSI) Sveitsistä.

Mitä ovat muovit ja biohajoavat muovit?

Muovit ovat laaja joukko synteettisiä ja puolisynteettisiä materiaaleja, jotka käyttävät polymeerejä pääainesosanaan. Modernі maailma kohtasi muovi-/polymeerimateriaalit ensimmäistä kertaa 1400-luvulla, kun Columbus löysi luonnonkumia Haitista. Nykyaikana polymeerien keveyden ja helpon muokattavuuden ansiosta niillä on paljon erilaisia käyttökohteita keittiötyökaluista keinotekoisiin sydänläppiin. Monia polymeerejä käytetään elintarvikkeiden pakkauksissa, tekstiileissä sekä koneiden osissa ja ne ovat merkittävä osa kaatopaikalle päätyvistä kiinteistä jätteistä.

EU-raporttien mukaan muovipakkausten osat muodostavat noin 8% kaatopaikoille päätyvästä jätteestä. Lisäksi mikromuovit, jotka ovat pieniä, alle 5 mm kokoisia palasia, ovat iso ongelma joissa, järvissä ja merissä. Ne voivat olla hajoamatta useita vuosia. Kierrätysmateriaalien käyttö uuden valmistuksessa, jätteiden poltto energiantuotannossa ja biohajoaminen kompostissa tai maaperässä voidaan laskea muovijätteiden hävitysprosesseiksi. EU-strategiat "A EU Strategy for Plastics in a Circular Economy" ja "Plastic Waste: a EU strategy to protect the planet, defend our citizens and empower our industries" on kehitetty polymeerien haittojen vähentämiseksi. EU:ssa tuotetaan noin 25.8 miljoonaa tonnia muovijätettä joka vuosi. EU-raporttien mukaan vain 6% muovituotteista on valmistettu kierrätysmuoveista. Polymeerijätteen määrä on kasvanut hirvittävästi kertakäyttömuovien takia vuosittain. Uudelleenkäytettävyys ja luonnossa hajoavien polymeerien tuotanto ovat tärkeitä osia näissä strategioissa. Euroopan vihreän kehityksen ohjelman mukaan jätteiden vähentäminen, hiilidioksidipäästöjen kompensointi, resurssien säästäminen ja kestävä kehitys ovat pääprioriteetteja EU:ssa nyt ja tulevaisuudessa. Saavuttaaksemme asumiskelpoisemman ja vihreämmän maailman, biopolymeerejä tulisi kehittää ja käyttää.

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Drage cititorule,

Prima întâlnire transnațională a „Să folosim plasticul biodegradabil pentru viitor (FutureBio)" a avut loc în perioada 26-27 mai 2022 la Denizli, Turcia. FutureBio este un proiect de doi ani de parteneriate de cooperare KA220-HED în învățământul superior susținut de Agenția Națională Turcă, privind biopolimeri între unsprezece parteneri din Turcia și UE.

Universitatea Pamukkale (PAU) este coordonatorul proiectului, iar Universitatea Kırklareli (KLU) și Universitatea Selçuk (SU) din Turcia, Fondazione Bruno Kessler (FBK), Cosvitec Societa Consortile Arl (COSV), Universitá Degli Studi Di Trento (UNITN) și Indivenire srl (IND) din Italia, Universitatea Technica Cluj Napoca (CNU) din România, CTRL Reality Oy (CTRL) din Finlanda, Ostbayerische Technische Hochschule Regensburg (OTHR) din Germania și Universitatea de Științe Aplicate din Elveția de Sud (SUPSI) din Elveția sunt partenerii de proiect.

Care sunt materialele plastice și cele biodegradabile?

Materialele plastice reprezintă o gamă largă de materiale sintetice sau semisintetice care folosesc polimeri ca ingredient principal. Lumea modernă s-a întâlnit cu materiale plastice/polimerice pentru prima dată în anii 1400, după ce Columb a găsit o minge de cauciuc natural în Haiti. Astăzi, polimeri au găsit o gamă largă de aplicații datorită ușurinței, manipulării ușoare și găsesc o gamă largă de aplicații, de la ustensile de bucătărie până la valve cardiace artificiale. Mulți polimeri sunt utilizați în domeniul ambalajelor alimentare, textilelor și mașinilor și sunt părți importante ale deșeurilor solide eliminate în depozitele de deșeuri solide.

Potrivit rapoartelor UE, piesele de ambalare PM reprezintă aproximativ 8% din totalul deșeurilor din depozitele de gunoi. Pe lângă toate, microplasticele, care sunt fragmente minuscule sub 5 mm în dimensiune, reprezintă o mare problemă pentru scurgerile râurilor, lacurilor, mărilor și oceanelor. Ele pot rămâne intacte mulți ani. Reutilizarea în producție, incinerarea pentru generarea de energie, biodegradarea în

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Caro lettore,

Il primo incontro transnazionale di "Let's use biodegradable plastic for the future (FutureBio)" si è tenuto il 26-27 maggio 2022 a Denizli, in Turchia. FutureBio è un progetto biennale KA220-HED-Cooperation Partnerships in Higher Education, sostenuto dall'Agenzia nazionale Turca, sui biopolimeri con undici partner della Turchia e dell'UE.

L'Università di Pamukkale (PAU) è il coordinatore del progetto, e l'Università di Kırklareli (KLU) e l'Università di Selçuk (SU) dalla Turchia, la Fondazione Bruno Kessler (FBK), Cosvitec Societa Consortile Arl (COSV), l'Università Degli Studi Di Trento (UNITN) e Indivenire srl (IND) dall'Italia, Universitatea Technica Cluj Napoca (CNU) dalla Romania, CTRL Reality Oy (CTRL) dalla Finlandia, Ostbayerische Technische Hochschule Regensburg (OTHR) dalla Germania e University of Applied Sciences of Southern Switzerland (SUPSI) dalla Svizzera sono i partner del progetto.

Cosa sono le plastiche e le plastiche biodegradabili?

Le materie plastiche sono un'ampia gamma di materiali sintetici o semisintetici che utilizzano i polimeri come ingrediente principale. Il mondo moderno ha incontrato i materiali plastici/polimerici per la prima volta nel 1400, dopo che Colombo trovò una palla di gomma naturale ad Haiti. Oggi i polimeri hanno trovato un'ampia gamma di applicazioni grazie alla loro leggerezza, alla facilità di manipolazione, e trovano un'ampia gamma di applicazioni, dagli utensili da cucina alle valvole cardiache artificiali. Molti polimeri sono utilizzati nei settori dell'imballaggio alimentare, del tessile e dei macchinari e costituiscono una parte importante dei rifiuti solidi smaltiti nelle discariche per rifiuti solidi.

Secondo i rapporti dell'UE, le parti di imballaggio in PM rappresentano circa l'8% dei rifiuti complessivi nelle discariche. Inoltre, le microplastiche, che sono minuscoli frammenti di dimensioni inferiori a 5 mm, rappresentano un grosso problema per le perdite di fiumi, laghi, mari e oceani. Possono rimanere intatte per molti anni. Il riutilizzo nella produzione, l'incenerimento per la produzione di energia, la biodegradazione nel compost o nel suolo possono essere considerati processi di smaltimento dei rifiuti di plastica. Per ridurre tutti gli effetti negativi causati dai polimeri, sono state sviluppate le strategie "A EU Strategy for Plastics in a Circular Economy" e "Plastic Waste: a EU strategy to protect the planet, defend our citizens and empower our industries". Nell'UE, ogni anno vengono prodotti circa 25,8 milioni di tonnellate di rifiuti di plastica. I rapporti dell'UE affermano inoltre che solo il 6% dei prodotti in plastica viene riciclato. I rifiuti polimerici

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Sevgili Okuyucu,

"Haydi, Gelecek için Biyobozunur Plastik Kullanalım (FutureBio)" projesinin ilk ulusötesi toplantısı 26-27 Mayıs 2022 tarihlerinde Denizli'de gerçekleştirildi. FutureBio, Türkiye ve AB'den 11 ortak ile yürütülen biyopolimerler üzerine Türkiye Ulusal Ajansı tarafından desteklenen iki yıllık bir KA220-HED-Yüksek Öğrenimde İşbirliği Ortaklıkları projesidir.

Pamukkale Üniversitesi koordinatörlüğünde, Türkiye'den Selçuk and Kırklareli Üniversitesi; İtalya'dan Cosvitec Societa Consortile Arl, Fondazione Bruno Kessler, Universita Degli Studi Di Trento and Indivenire srl; Almanya'dan Ostbayerische Technische Hochschule Regensburg; Romanya'dan Universitatea Tehnica Cluj-Napoca; Finlandiya'dan CTRL Reality Oy ve ilgili ortak olarak İsviçre'den University of Applied Sciences of Southern proje ortağı olarak görev yapacak.

Plastik ve Biyobozunur Plastik Nedir?

Plastikler, ana bileşen olarak polimerleri kullanan çok çeşitli sentetik veya yarı sentetik malzemelerdir. Modern dünya ilk kez 1400'lü yıllarda Columbus'un Haiti'de doğal bir lastik top bulması ile plastik/polimerik malzemelerle tanışmıştır. Günümüzde polimerler, hafifilikleri, kolay manipülasyonları sayesinde mutfak gereçlerinden yapay kalp kapakçıklarına kadar geniş bir uygulama alanı bulmuşlardır. Gıda paketleme, tekstil ve makine alanlarında birçok polimer kullanılmaktadır ve katı atık depolama sahalarında bertaraf edilen katı atıkların önemli bir parçasıdır.

AB raporlarına göre, PM ambalaj parçaları, çöplüklerdeki toplam çöpün yaklaşık %8'ini temsil ediyor. Bunların yanı sıra 5 mm'nin altında küçük parçacıklar olan mikroplastikler nehir, göl, deniz ve okyanusların sızmasında büyük sorun teşkil etmektedir. Uzun yıllar bozulmadan kalabilirler. Üretimde yeniden kullanım, enerji üretimi için yakma, kompostta veya toprakta biyolojik bozunma, plastik atıklar için bertaraf işlemleri olarak sayılabilir. Polimerlerin neden olduğu tüm olumsuzlukları azaltmak için "Döngüsel Ekonomide Plastikler İçin Bir AB Stratejisi" ve "Plastik Atık: Gezegeni korumak, vatandaşlarımızı savunmak ve endüstrilerimizi güçlendirmek için bir AB stratejisi" geliştirilmiştir. AB'de her yıl yaklaşık 25,8 milyon ton plastik atık üretilmektedir. AB raporları ayrıca, AB'de plastik ürünlerin yalnızca %6'sının geri dönüştürülmüş plastik olarak talep edildiğini belirtiyor. Polimerik atık, her yıl 'tek kullanımlık' plastiklerle korkunç bir şekilde artıyor. Yeniden kullanılabilirlik ve doğada parçalanabilen polimer üretimi bu stratejilerin önemli parçalarıdır. Avrupa Yeşil Anlaşma Tebliğine göre, atıkların azaltılması, karbon ayak izi emisyonlarının telafi edilmesi, kaynakların korunması ve sürdürülebilirlik, AB için şimdi ve gelecekte temel

http://www.futurebioproject.eu/login_up.php/Home/newsletters

2.3. Newsletters

E-Newsletters have been issued to promote the project and its outputs, and translated for disseminating to national training organizations, stakeholders, and media. For this purpose, the partnership used its National Informal Networks. Newsletters were foreseen, 1 every 6 months of the project. Additionally, partners took advantage of their own networks and of the existing platforms and tools for promotion on European level, to maximize the publicity effect. The dissemination plan at the beginning of the project has been prepared by all partners to widespread the products and have a vast outreach.

http://www.futurebioproject.eu/login_up.php/Home/newsletters

2.4. Layman Report

Within the dissemination activities for the public, the Layman's Report provided a general and brief overview of the project and its outcomes, such as the challenges faced by the project, the proposed solutions, the innovative aspects of such solutions, the main achievements and outputs, the main results of the implemented pilots or recommendations for the future. The Layman's Report was the final dissemination activity within the project's duration. Layman's report summarizes the work of a LIFE FutureBio project for a general audience. They are a means of extending the impact of the project beyond the area of implementation.

2.5. International Report

A common innovative course curriculum has been created (PR1) to develop the knowledge and skills, revealing the gaps in current education. In Phase 2 (PR1), national and international reports have been prepared including situations and needs analyses for academics, students, and companies. At the same time, these analyses have revealed awareness situations for individuals and institutions. Company lists were created by the partners.

Companies/Associations/Institutions engaged in the research, production, and application of Bioplastics for .....

Company name	Company address	Company's sector of work	Company website	The company's contact email address	Contact person		Company products/applications
					Name and Surname	Email address	
Novapolimeri Srl	Via Nardi, 92 36060 Fellette di Romano d'Ezzelino (VI) Italy	Materials	https://novapolimeri.com/	novapolimeri@novapolimeri.com			Distribution and trading of thermoplastic materials (injection/extrusion)
Fanuc Italia	Via Lodi, 13 20045 Lainate MI (Italy)	Industrial automation	https://www.fanuc.eu/it/it	info@fanuc.eu; service.it@fanuc.eu			Industrial automated machines (also for the processing of polymers)
Almablend	Zona Industriale Mazzocchio II 04014 Pontina (LT) Italia	Materials	https://almablend.it/en	info@biowaresrl.it			Almablend is a family of innovative biopolymeric compounds based on PLA.
Arburg Italia	ARBURG Srl Via G. di Vittorio 31 B 20068 Peschiera Borromeo MI Italia	Processing of polymers	https://www.arburg.com/en/	italy@arburg.com	Vincenzo Ferrario (italy@arburg.com) Branch Manager: Raffaele Abbruzzetti (raffaele_abbruzzetti@arburg.com)		
Alfatest	Via Pellizza da Volpedo, 59 - 20092 Cinisello Balsamo (MI) Italy	Scientific instruments	https://www.alfatest.it/contatti	info@alfatest.it			Scientific instruments for the test of materials

A total of 589 students were involved in a specially designed questionnaire through face-to-face interviews and online applied between June–July 2022 in Technical University of Cluj Napoca, Romania, Pamukkale University, Selcuk University and Kirkareli University from Turkey, University of Trento, and Cosvitec from Italy, SUPSI from Switzerland, and OTH from Regensburg, Germany.

A total of 221 academic staff were involved in from Technical University of Cluj Napoca, Maramures County from Transylvania Region, Romania, Pamukkale University, Selcuk University and Kirklareli University from Turkey, University of Trento, SUPSI from Switzerland, and OTH Regensburg, Germany.

271 industrial employers were involved in small and medium enterprises or individual activities from Romania, Turkey, Italy, and Finland.

http://www.futurebioproject.eu/tr/Home/PR12

PR1: INTERNATIONAL REPORT

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0.1	01.08.2022	Gratiela Dana BOCA (Technical University of Cluj Napoca)	First draft

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PR1: REPORT INTERNAZIONALE

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DISCLAIMER

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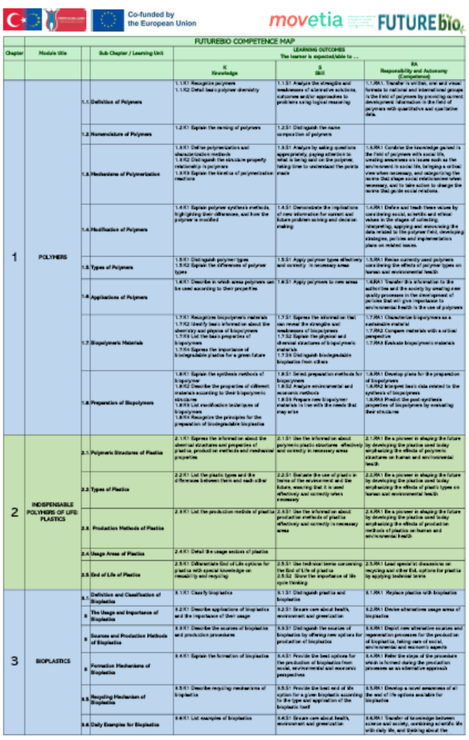
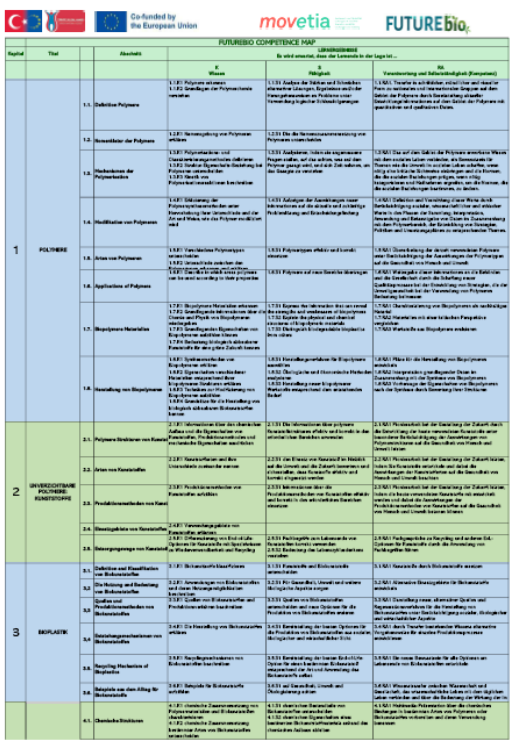
Version e	Dati	Autore (Partner/Persona)	Motivo della revisione
0.1	01.08.2022	Gratiela Dana BOCA (Università Tecnica di Cluj Napoca)	Prima bozza
0.1	28.12.2022	Aniello GERVASIO (COSVITEC scarl)	Traduzione

1

At the 2nd TPM in Finland on the 6th month of the project, the result of PR1 at national and international level was discussed and analyzed. The partnership gave the curriculum's final form and created a competence map. These analyses, curriculum, and competence map were used to form the basis of PR2 and PR3.

http://www.futurebioproject.eu/tr/Home/PR13





2.6. Lecture Guidebook

University students, academicians and the industrial firms and employees were FutureBio's target groups, respectively. For a better world, biodegradable polymers should be developed and used. Although research on biodegradable polymers is increasing day by day, their usage is not at the desired level. However, teaching programs including applications can be performed to gain the knowledge and skills about the synthesis, properties, and applications of biopolymers. A common innovative course curriculum has been created (PR1) to develop the knowledge and skills, revealing the gaps in current education. Most of the current English books are focused on medical or food applications of biopolymers. Moreover, there are very few books on biodegradable plastics and their applications.

As the book will fill a gap in the literature, it is one of the basic works in the related field. On the other hand, there isn't any course book in TURKISH related to biopolymer technology. In this area, a scientific resource that can be taught in Turkish universities is obtained. Since the book is also prepared in English, it can be used all over Europe and the world.

The guidebook, which contains examples from the project partners' works and industry applications, is innovative in this respect. It is a book that people from different disciplines can use according to their interests.

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CHAPTER 8: PAST, CURRENT AND FUTURE OF BIODEGRADABLE PLASTICS: INNOVATIVE APPLICATIONS

Massimo Bersani

8.1.Brief History of Plastic and Bioplastic

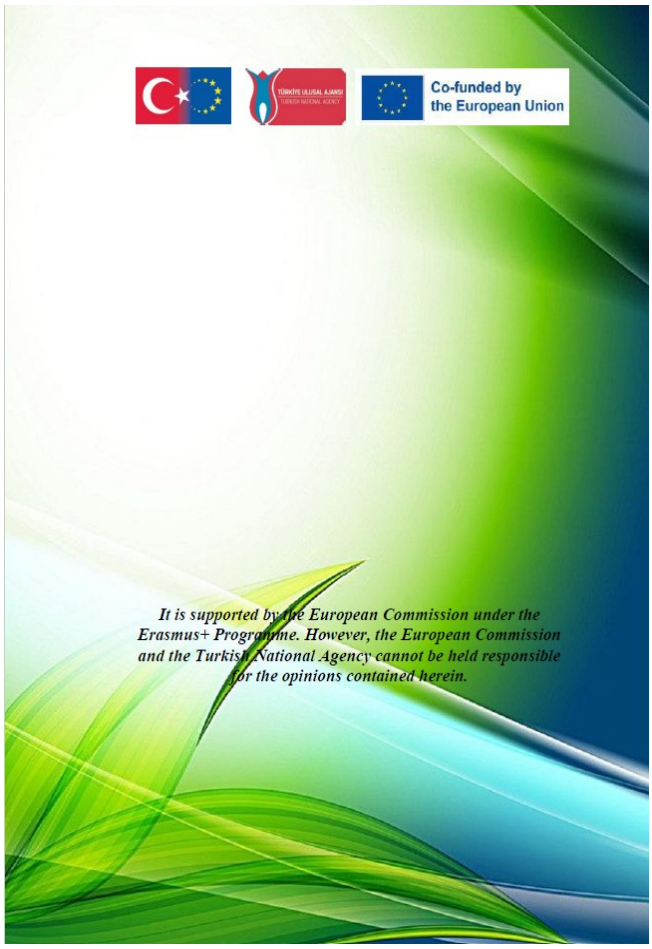
Massimo Bersani

Plastic has a rich history dating back to the mid-19th century when scientists began to experiment with various chemicals and natural materials in an effort to create a substitute for materials such as ivory and tortoise shell.

However, it was not until the early 20th century that plastic became widely used in industry and consumer products. The invention of Bakelite, the first synthetic plastic, by Belgian chemist Leo Baekeland in 1907 was a significant breakthrough in the development of plastics. Bakelite was a thermosetting plastic that could be molded into any shape and was highly durable, making it ideal for use in electrical and automotive industries.

During World War II, plastic production increased dramatically as it was used in a variety of military applications, including aircraft parts, parachutes, and insulation. After the war, the demand for plastic continued to grow as it became a popular material for consumer products such as toys, household items, and packaging.

CHAPTER 8



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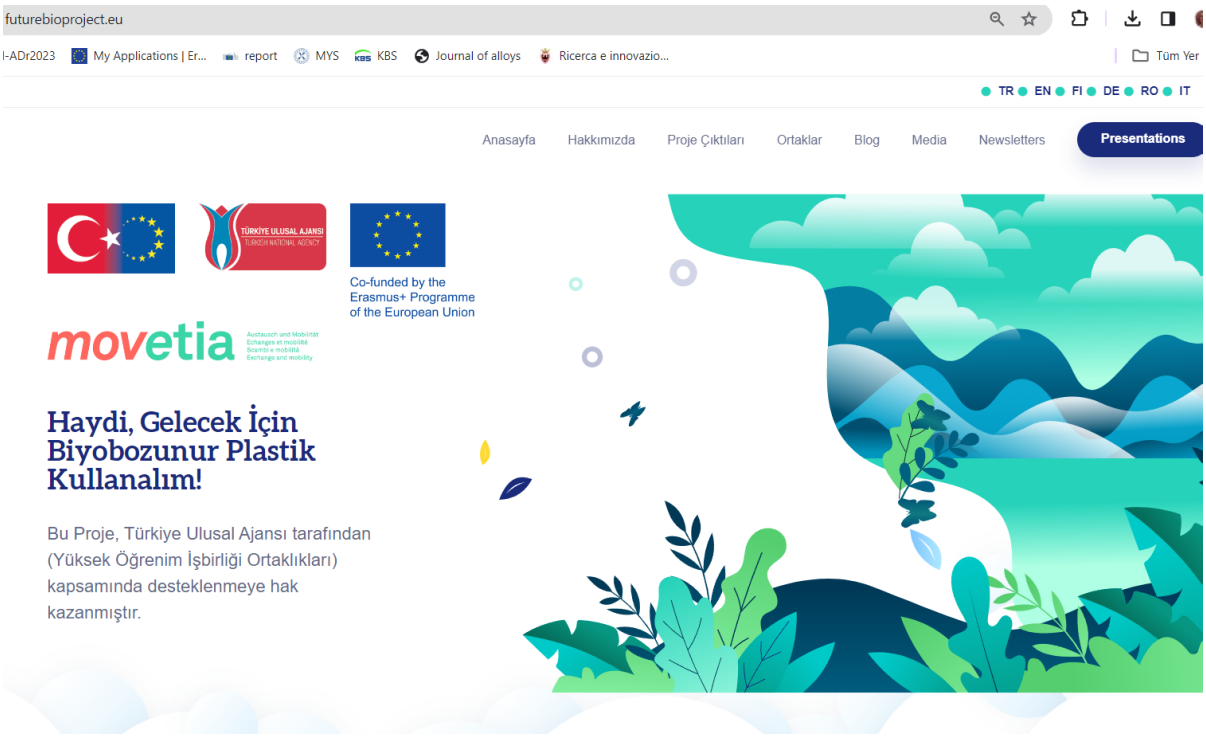
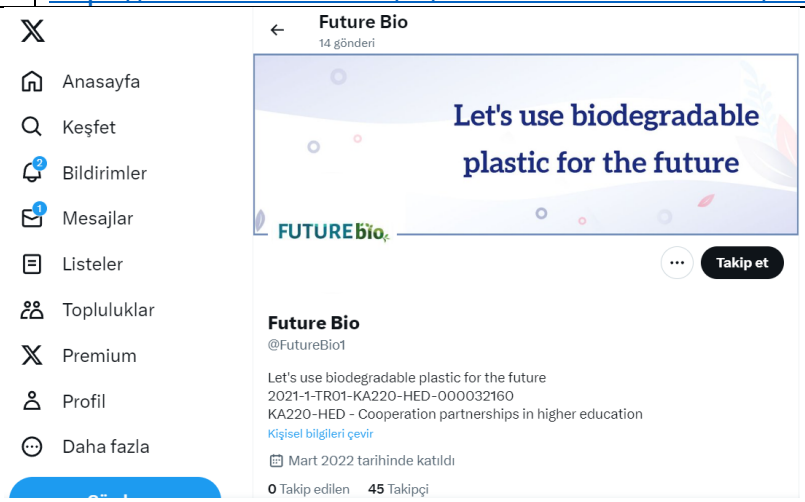
2.7. Website and social media accounts

In the 1st TPM, after discussing with all partners on the draft design prepared by PAU, the website design was decided. Creation of website and leaflet, and opening of social media accounts (Facebook, Instagram, and Twitter) were done by PAU at the beginning of the project.

The website address is: https://www.futurebioproject.eu/



Social Media Platform	Account Adress
Instagram	https://www.instagram.com/futurebioproject/?igsh=MXhpMG16bmR2eTFl
YouTube	https://www.youtube.com/@futurebio7438
Twitter	https://twitter.com/FutureBio1
LinkedIn	https://www.linkedin.com/in/future-bio-800355235/?originalSubdomain=tr

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21 takip
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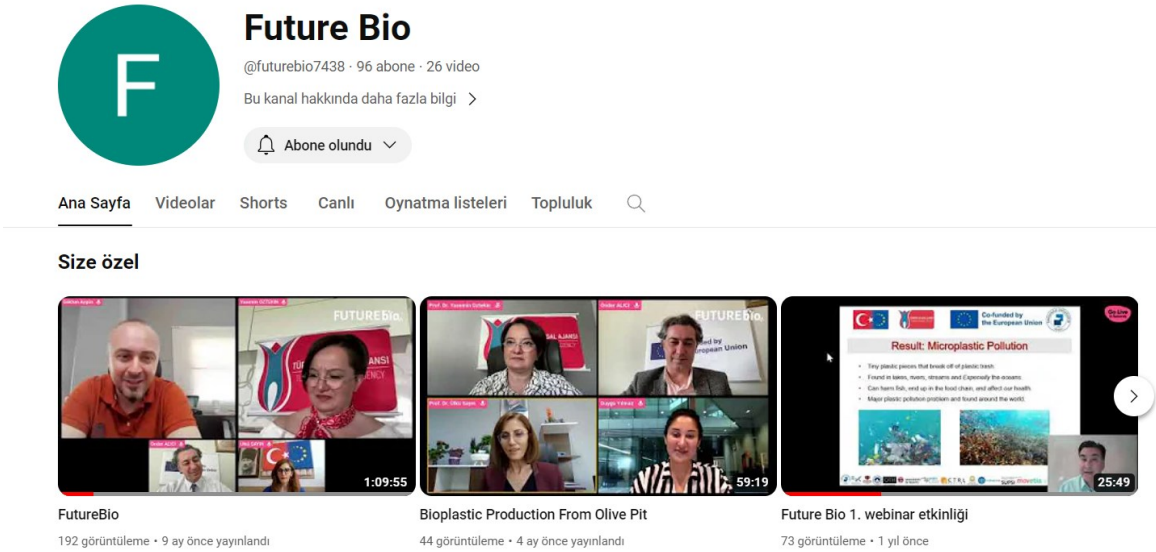
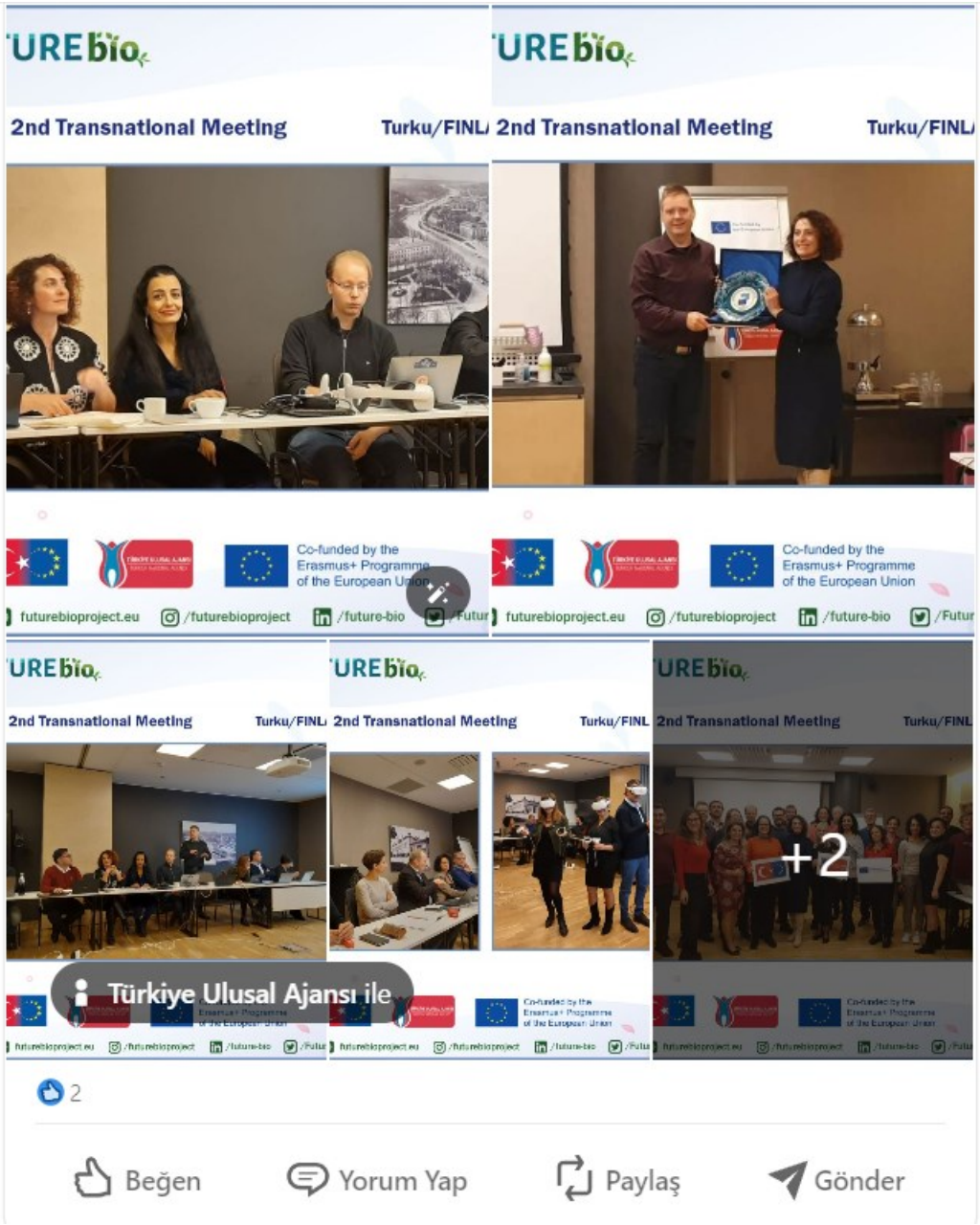
FBK / Italy
Germany


Future Bio
@futurebio7438 · 96 abone · 26 video
Bu kanal hakkında daha fazla bilgi
Abone olundu
Ana Sayfa
Videolar
Shorts
Canlı
Oynatma listeleri
Topluluk
Size özel
1:09:55
59:19
Result: Microplastic Pollution
25:49
FutureBio
192 görüntüleme • 9 ay önce yayınlandı
Bioplastic Production From Olive Pit
44 görüntüleme • 4 ay önce yayınlandı
Future Bio 1. webinar etkinliği
73 görüntüleme • 1 yıl önce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Türkiye Ulusal Ajansı ile
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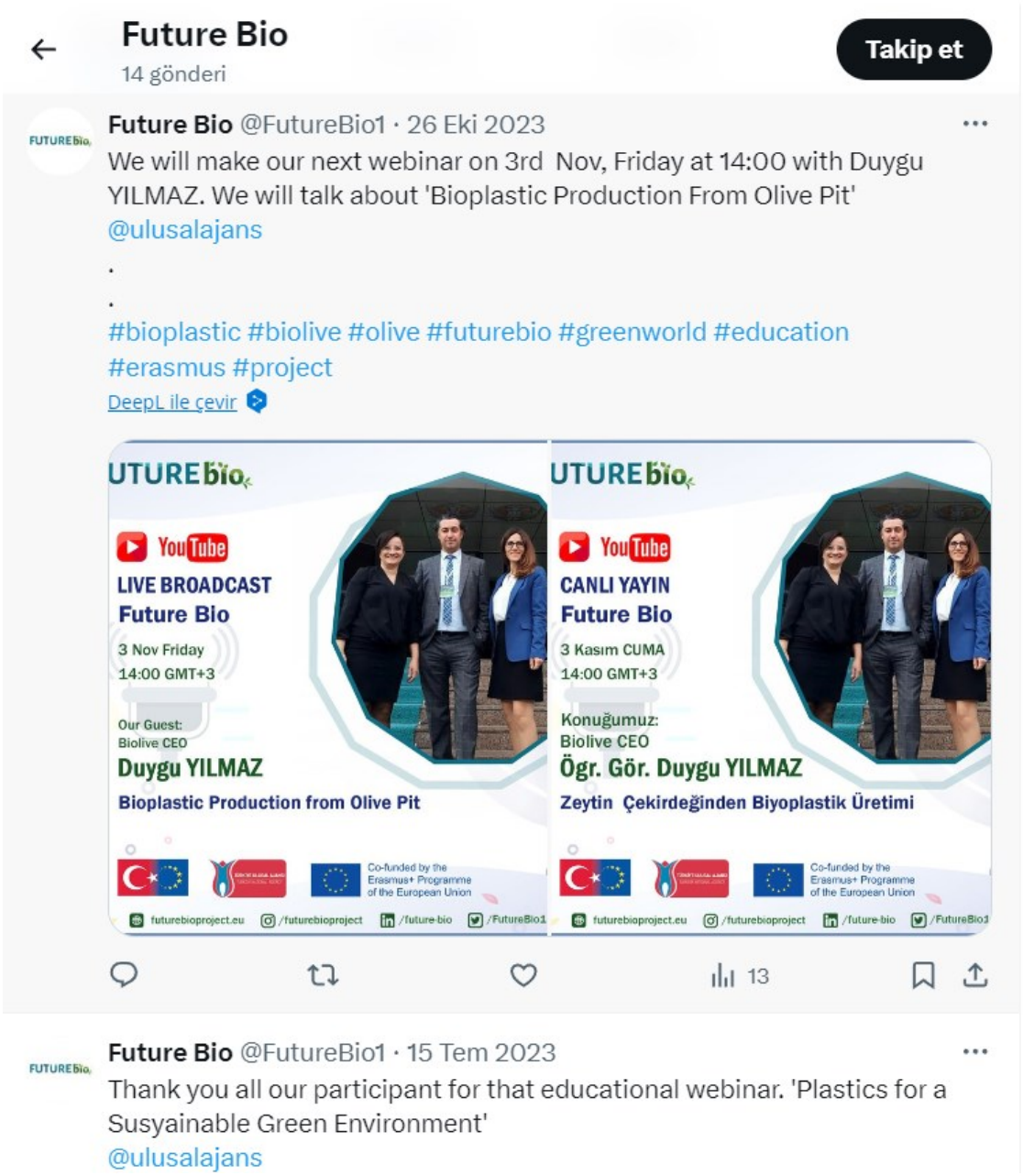
Beğen
Yorum Yap
Paylaş
Gönder



2.8. Interactive open access education modules

Since the main target group for this result is students, it was planned to open 2 courses on biopolymers in Technology Faculty of PAU and within the scope of The Graduate School of Natural and Applied Science In accordance with the prepared curriculum (PR1), in the 2nd year of the project, educational activities would be carried out in these courses. A total of 6 courses were offered in two graduate degrees at departments at PAU (Mechanical and Manufacturing Engineering and Metallurgy and Materials Engineering) and 3 of these courses were actively conducted. In the 2nd year of the project, educational activities have been carried out in these courses:

MMLM 509 BIOPOLYMERS AND BIONANO COMPOSITE MATERIALS

MMLM 512 MECHANICAL TESTS OF POLYMER MATERIALS

MAIM 502 MANUFACTURING TECHNOLOGIES

MAIM 529 NANOSCIENCE AND NANOTECHNOLOGY

MAIM 531 POLYMER PRODUCTION AND TECHNOLOGY

MAIM 533 BIOPOLYMER AND BIOCOMPOSITE ENGINEERING

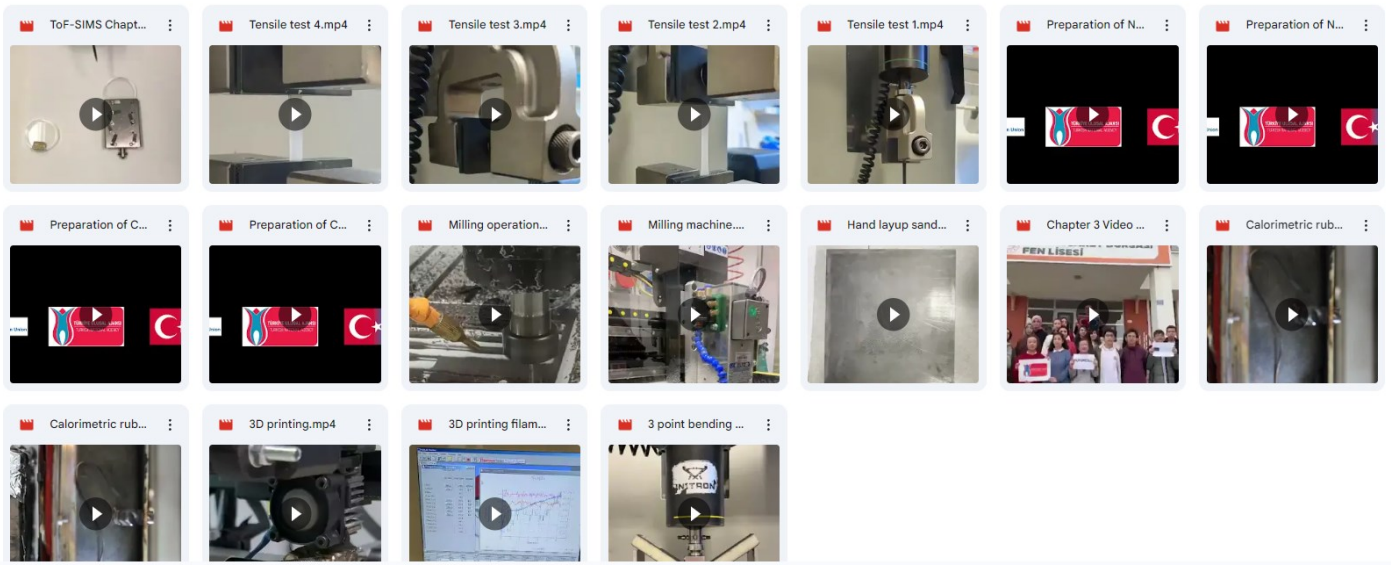
In addition, at the undergraduate level following courses were opened:

MBM 201 MATERIAL SCIENCE 1

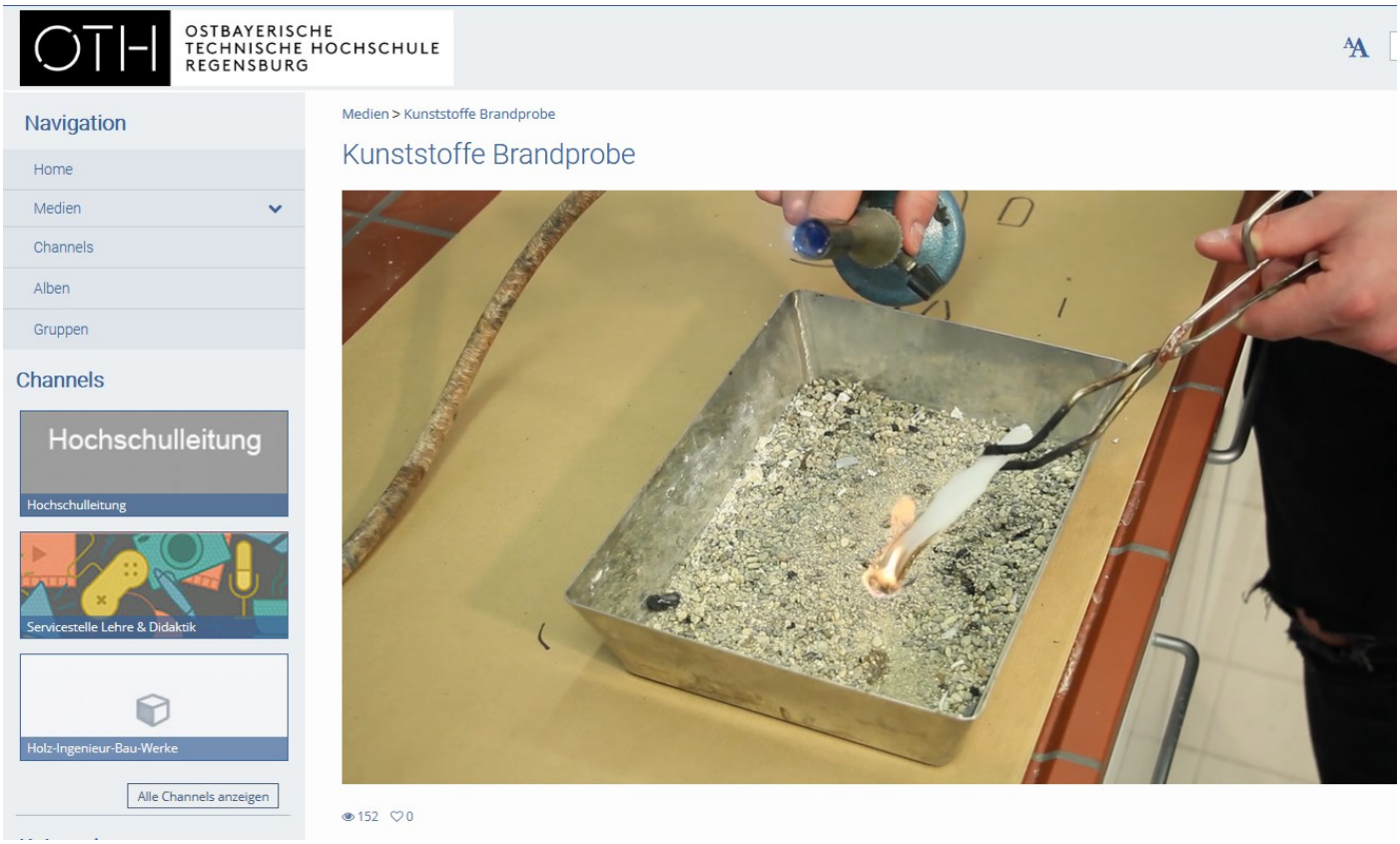
MBM 202 MATERIAL SCIENCE 2

Similar work was done at all other partner universities.

The studies of BPs are interdisciplinary research including different kinds of experts from material science, biotechnology, physics, chemistry, and engineering from environment to manufacturing and medical technologies. The required competencies for these areas can be put together along the concept of biopolymer engineering providing novel concepts, materials, enzyme technology, experimental protocols, reference substances, as well as inventions. There have been no online modules prepared on experiments for the LABORATORY APPLICATIONS at university level. However, laboratory works are especially helpful to gain the knowledge and skills to make scientific evaluations about the synthesis, properties, and applications of biodegradable polymers. Within the scope of laboratory videos (including production, analysis, tests), *18 videos* were prepared.



At OTH, 2 further lab videos were shared among university students and viewed more than 150 times.

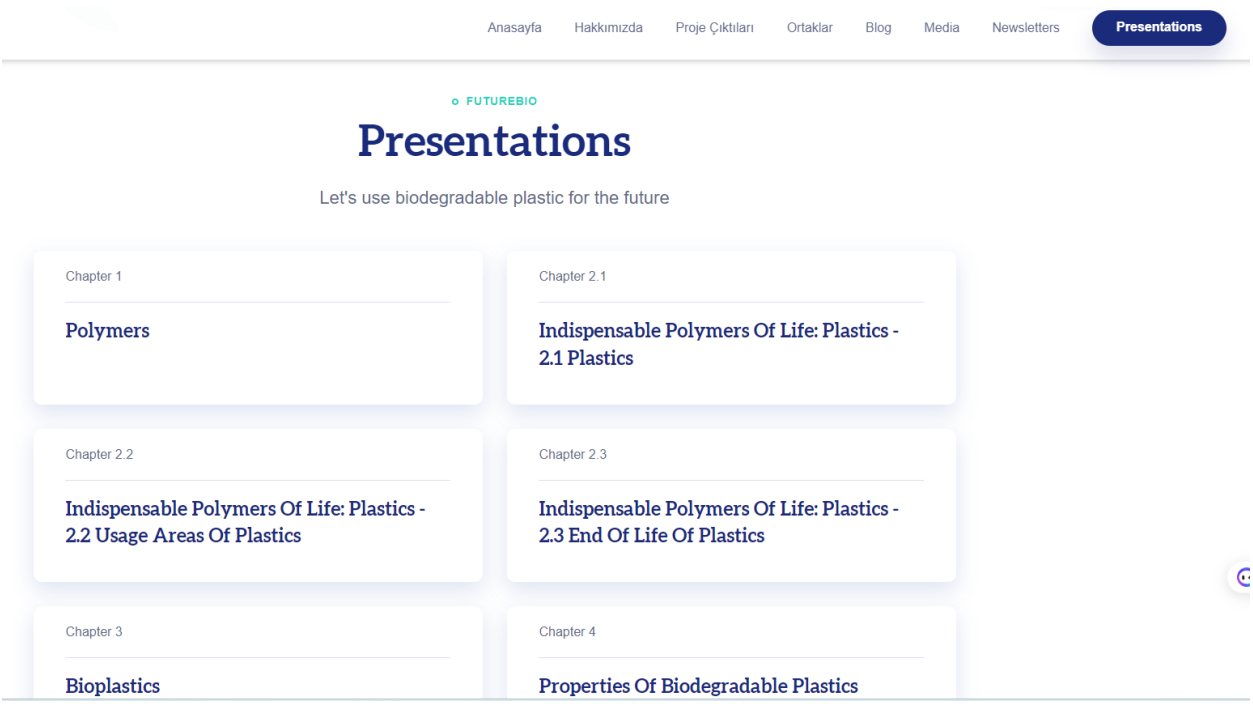


FutureBio aimed to create innovative technologies based on E-LEARNING and interactive learning tools with interactive videos and animations in-game format. The materials have been structured according to a competency-based learning approach (PR1). The use of e-learning technologies in the FutureBio project can provide new opportunities for learners increasing flexibility, motivation, and engagement. Students can take control of their own learning and become an active part of the learning process.

Increasing digital competencies, enhancing the quality of education, and making it interesting, developing environmental awareness, encouraging biodegradable polymers to be included in the study and research topics of students, academicians, and industrial companies, raising awareness about sustainable environment and decarbonization is among the aims of this result. With the creation of the laboratory videos and the interactive platform targeting game-based learning, this project result is highly impactful on all target groups, and it has high potential of dissemination and transferability.

The quality of the project materials/results depends on the expertise of the project partners and their ability to bring this expertise together on a specific platform. For the OERs created under the project, SUPSI provided training to the project consortium and prepared a guide for the preparation of quality and standardized online materials. During and after the preparation of these modules with the support of SUPSI, we have received feedback from our project partners that they will use these learnt practices especially in the preparation of course materials. Therefore, we have achieved another objective of this project outcome, which is to increase the digital capacities of the project partners.

http://www.futurebioproject.eu/tr/Home/oers


Anasayfa
Hakkımızda
Proje Çıktıları
Ortaklar
Blog
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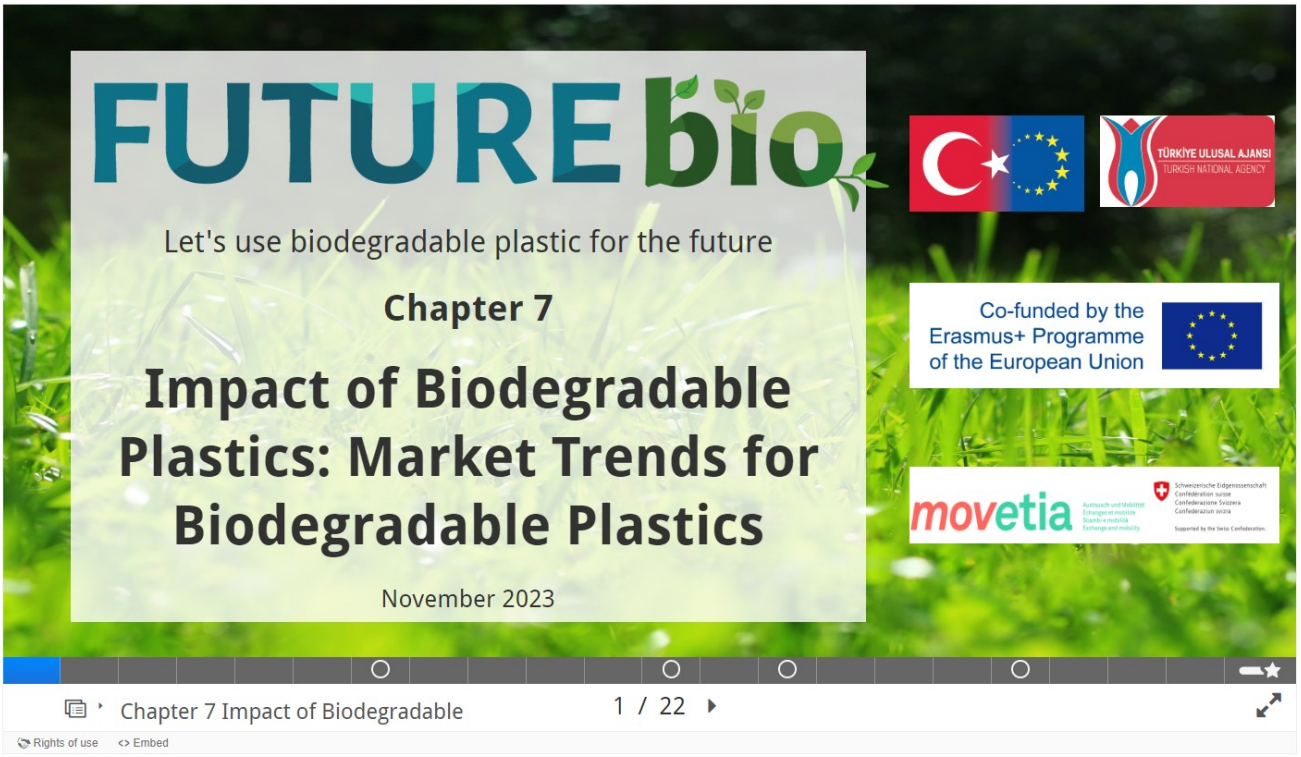
Presentations
FUTUREBIO
Presentations
Let's use biodegradable plastic for the future
Chapter 1
Polymers
Chapter 2.1
Indispensable Polymers Of Life: Plastics - 2.1 Plastics
Chapter 2.2
Indispensable Polymers Of Life: Plastics - 2.2 Usage Areas Of Plastics
Chapter 2.3
Indispensable Polymers Of Life: Plastics - 2.3 End Of Life Of Plastics
Chapter 3
Bioplastics
Chapter 4
Properties Of Biodegradable Plastics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Let's use biodegradable plastic for the future
Chapter 7
Impact of Biodegradable Plastics: Market Trends for Biodegradable Plastics
November 2023
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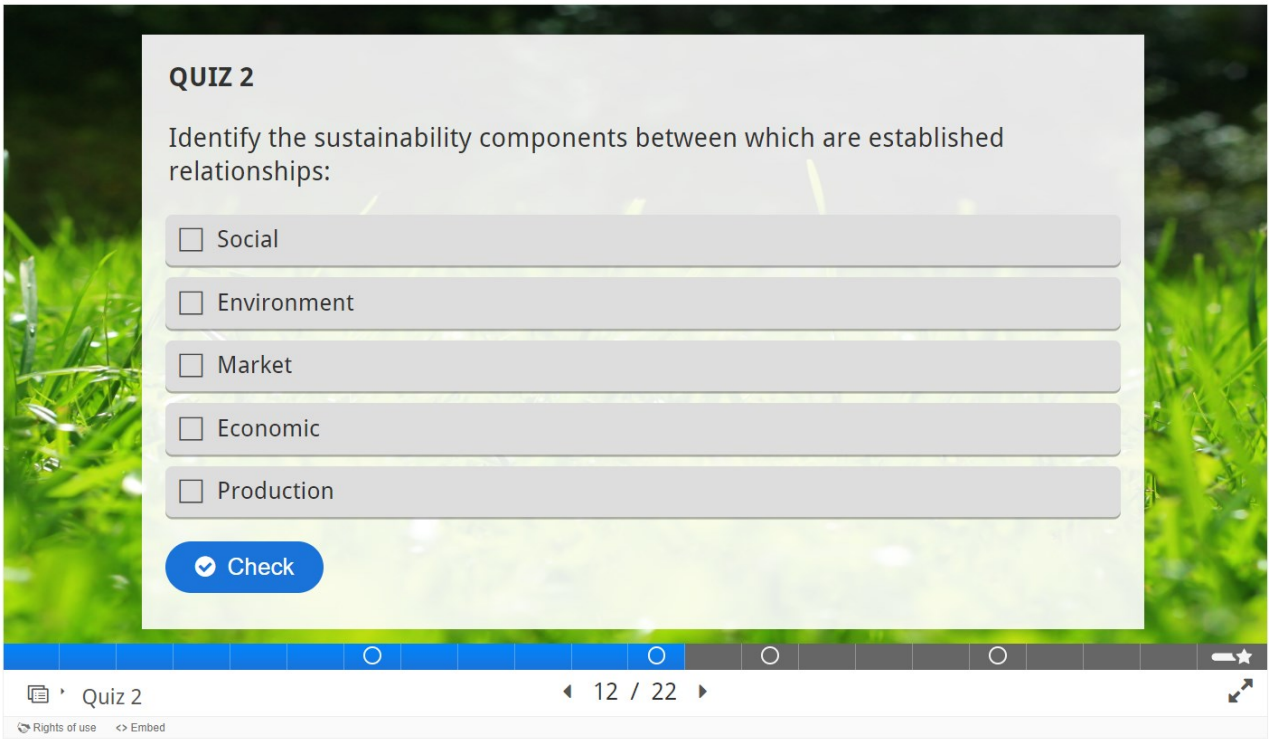
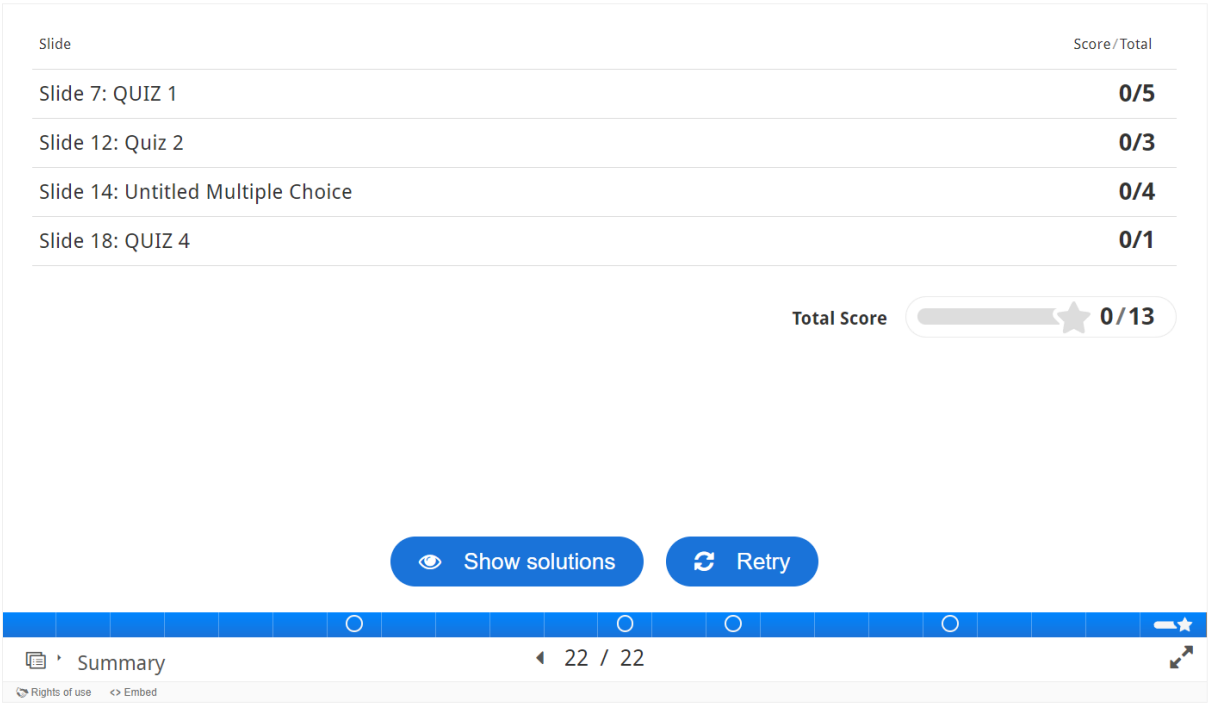




Presentations of Let's use biodegradable plastic for the future

Chapter 1 Polymers

Chapter 2.1 Indispensable Polymers of Life: Plastics - 2.1 Plastics

Chapter 2.2 Indispensable Polymers of Life: Plastics - 2.2 Usage Areas of Plastics

Chapter 2.3 Indispensable Polymers of Life: Plastics - 2.3 End Of Life Of Plastics

Chapter 3 Bioplastics

Chapter 4 Properties of Biodegradable Plastics

Chapter 5 Characterization of Biodegradable Plastics

Chapter 6 Bioplastics Applications

Chapter 7 Impact of Bioplastics: Market Trends For Biodegradable Plastics

Although the book consists of 8 chapters, it was accepted by the project consortium to create training materials for 7 of the online open access modules. Some of the chapters are extensive in content, so more than one presentation file was prepared.

2.9. VR Tools

The VR training solutions complement the innovative curriculum, guidebook, and online material. There have been no VR tools prepared on manufacturing and using of BDPs. Production from different materials, characterization methods, polymer pollution, and the environmental sustainability are the main topics.

VR as a technology has the power to take the user into another place. This has been utilized in making more immersive, interactive, and illustrative training materials which complement the more traditional books and online materials. Furthermore, virtual reality solution makes the training more motivating for all the target groups. The created VR application consisted of a set of 360-degree images and videos with added informative (such as text, photos, audio, video) and gamified content (such as quiz, finding hidden information). The best user experience gained by using mobile VR glasses (such as Oculus Go / Quest / Quest 2) where the user gets a stereo view to the training content. The universities and companies often already have these devices, and they are available for a reasonable price. VR glasses have been used when presenting the material in the events of the project. The VR content has been also provided through a web browser which makes it available also to those users, not in possession of compatible VR glasses.

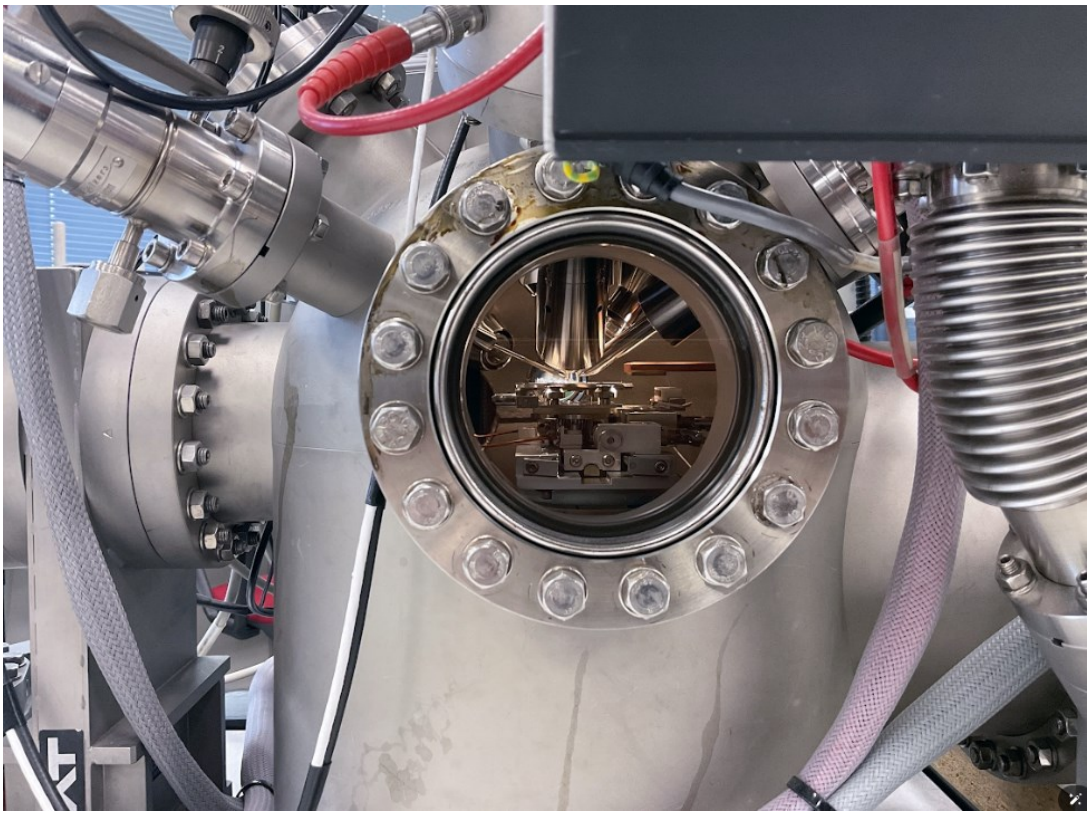
The content of the VR application is targeted to three use cases:

1. For the university teachers: An immersive view to a lab exercise for setting up a similar exercise. The purpose is to ease the starting of necessary exercises by having an immersive view to a model exercise.

2. For the university students:

a) An immersive view to a lab demonstration which is not possible to be implemented due to safety or equipment/cost reasons.
b) A tour to a chemistry plant for viewing in industry scale the process done in the exercise as a lab size.

3. For the public: For viewing the impact of unprocessed plastic waste to the environment and the choices one can make in everyday life.



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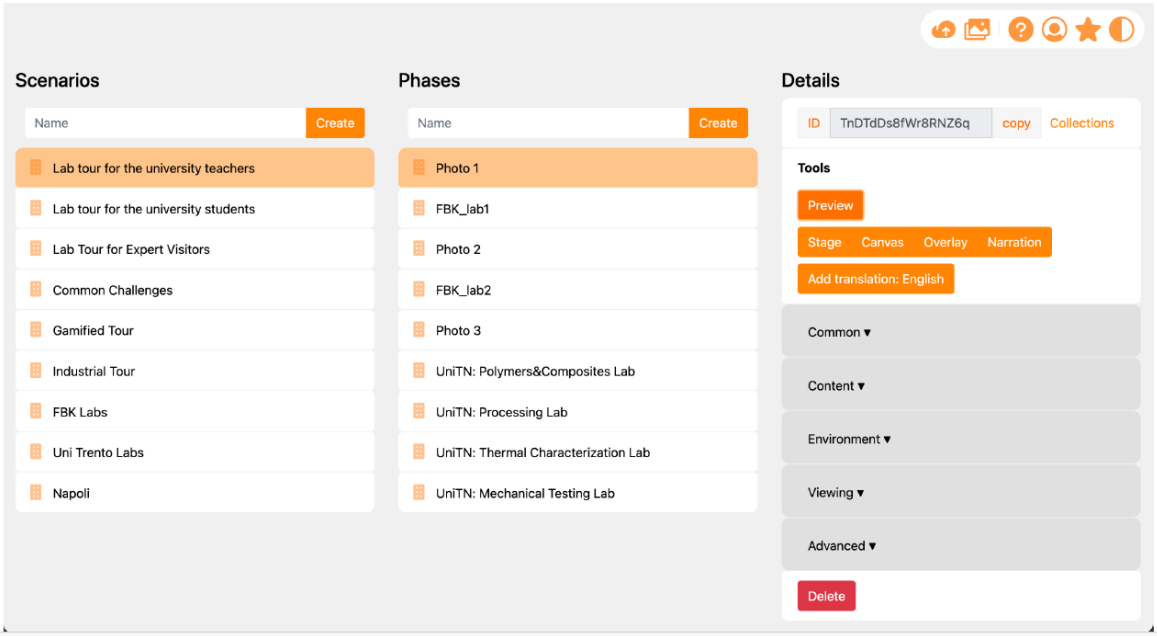

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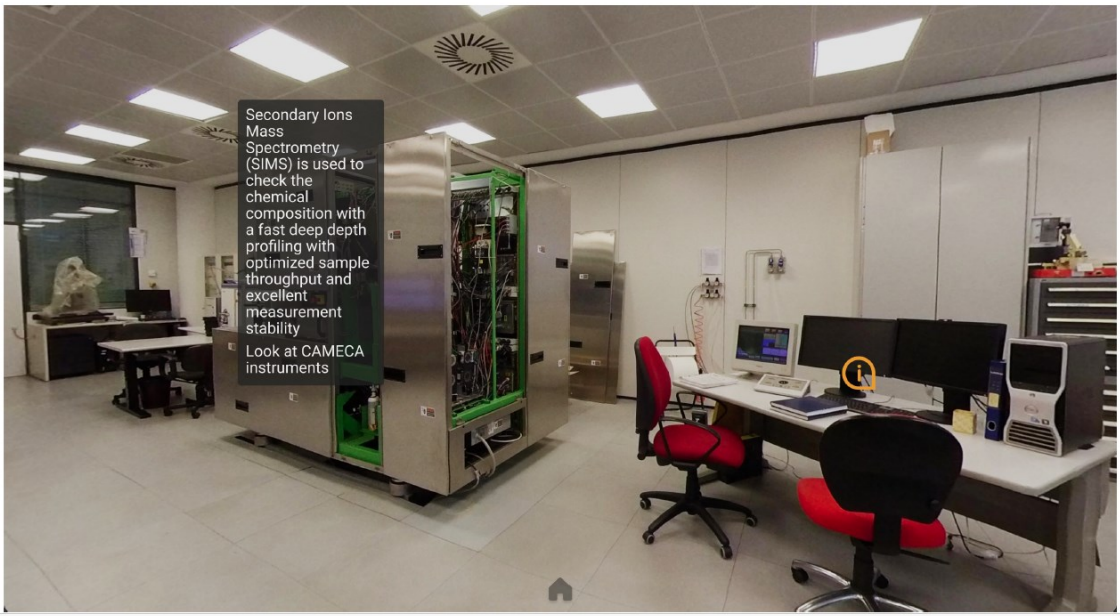


FutureBio VR Transferability Guide has been written to support integrating VR training into teaching. The guide provides both technical instructions as well as pedagogical tips for utilizing FutureBio applications in teaching. The guide gives answers to four questions:

- What are the materials created in FutureBio?
- How can I access the materials?
- How do I interact with the materials?
- How should I utilize the materials in teaching?

In essence, the materials created in FutureBio are 360 images taken in several different bioplastic research laboratories in the partner organizations: University of Trento and FBK. The photographs are presented in a VR application for an immersive viewing experience, but they can also be viewed through a website.

The images allow users to get a virtual tour of the laboratories while learning about the technology and methodologies utilized there. Several types of materials have been created using the same 360 imagery: some of the materials are aimed at plastic professionals, some for teachers, and some for students. Even though the 360 images don't change, all the attached information changes depending on the context.

The materials created in FutureBio have been published in the Meta Store for VR, and on a webpage for more traditional access.

FutureBio offers a wealth of immersive materials created from 360 images captured in various bioplastic research laboratories affiliated with partner organizations such as the University of Trento and FBK. These materials, accessible both through a VR application and a website, serve as invaluable resources for educators looking to incorporate innovative teaching methodologies into their curriculum.

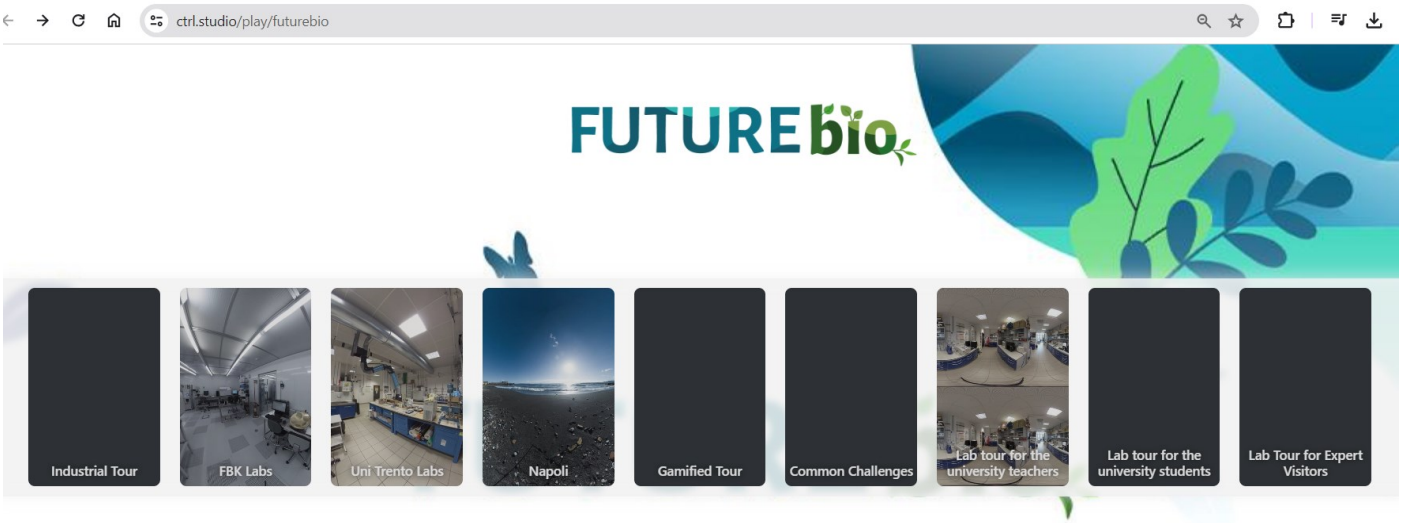
The utilization of the materials in teaching depends on whether you have VR headsets available or not. Viewing the materials in VR can be compared to visiting the laboratories in real life, due to the high level of immersion VR headsets can cause. One can be sure that students really are focused on the subject when it is presented in VR!

Accessing the materials through a web browser makes it possible to go through the materials in front of the classroom by sharing a screen or have each student access the material on their own computer or mobile device. Doing it this way does have the problem of not being able to control what the students are looking at, or whether they are focused at all.

Here are some strategies for effectively utilizing these materials in teaching:

1. Virtual Laboratory Tours: Introduce students to the world of bioplastic research by taking them on virtual tours of the laboratories featured in the FutureBio materials. Encourage them to explore the 360-degree images, providing them with a firsthand look at the technology and methodologies utilized in these laboratories.
2. Interactive Learning Experiences: Engage students in interactive learning experiences by incorporating the immersive materials into classroom activities. Encourage them to interact with the virtual environment, explore different aspects of bioplastic research, and discover the underlying principles and techniques.
3. Contextualized Learning: Tailor the use of FutureBio materials to suit the specific needs and interests of your students. Whether they are bioplastic professionals, teachers, or students, ensure that the information provided alongside the 360 images is relevant and contextualized to their level of understanding and expertise.
4. Multidisciplinary Approach: Embrace a multidisciplinary approach to teaching by integrating the FutureBio materials across various subject areas. Explore connections between bioplastic research and subjects such as biology, chemistry, environmental science, and sustainability, fostering a holistic understanding of the topic.
5. Project-Based Learning: Encourage project-based learning initiatives where students can apply their knowledge gained from the FutureBio materials to real-world scenarios. Challenge them to design and implement their own bioplastic experiments, fostering creativity, critical thinking, and problem-solving skills.

6. Assessment and Reflection: Incorporate assessments and reflection activities to gauge students' understanding and engagement with the FutureBio materials. Encourage them to reflect on their virtual laboratory experiences, analyze the information presented, and articulate their insights and observations.



2.10. Publications

a) A master science thesis titled "Biokunststoffe im Bauwesen" (Biopolymers in the construction sector) was completed by Lisa Schmidt under the supervision of Charlotte Thiel and Susanne Hüttner at OTH Regensburg.

OTH OSTBAYERISCHE TECHNISCHE HOCHSCHULE REGENSBURG

MASTERARBEIT

Lisa Schmidt

Biokunststoffe im Bauwesen

Fakultät:	Bauingenieurswesen
Studiengang:	Master Bauingenieurswesen
Abgabefrist:	30.09.2022
Aufgabenstellerin:	Prof. Dipl. Ing. Charlotte Thiel
Zweitprüferin:	M.Sc. Dipl. Ing. Susanne Hüttner

Kurzfassung

Kurzfassung

Kunststoffe sind aufgrund des fossilen Rohstoffursprungs, der Umweltverschmutzung und der generellen Müllproblematik in den letzten Jahren stark kritisiert worden. Eine Alternative zu den erdölbasierten Kunststoffen sind die aus nachwachsenden Rohstoffen hergestellten Biokunststoffe. Im Rahmen dieser Arbeit konnte gezeigt werden, dass Biokunststoffe eine nachhaltige Alternative darstellen. Der zweite Teil der Arbeit beschäftigt sich mit der Möglichkeit, Biokunststoffe im Baubereich als Verpackung oder Dämmstoff einzusetzen. Es zeigt sich, dass bei den Verpackungen bereits eine Recyclinginfrastruktur für die erdölbasierten Kunststoffe besteht. Die innovativen Biokunststoffe (z.B. PHA) werden bisher aufgrund der geringen Mengen nicht kommerziell recycelt. Das bedeutet für die recyclingfähigen Verpackungen, dass Drop-In Lösungen geeignet sind, weil hierbei die Recyclingfähigkeit erhalten bleibt. Bei den nicht recyclingfähigen Verpackungen zeigt sich sowohl der Einsatz von Drop-In-Kunststoffen als auch der von innovativen Biokunststoffen vorteilhaft. Da aus deren thermischen Verwertung erneuerbare Energie erzeugt und zusätzlich fossile Treibhausgasemission vermieden werden können. Bei den Dämmstoffen findet bisher kein Recycling der Baustellenabfälle statt. Hier steht die Etablierung einer Recyclinginfrastruktur an erster Stelle, um die Nachhaltigkeit der Dämmstoffe zu verbessern. Darüber hinaus kann eine Schonung der fossilen Ressourcen durch den Einsatz von Drop-In-Kunststoffen erzielt werden. Das hat den Vorteil das sie anders als die innovativen Biokunststoffe keinen eigenen Recyclingstrom benötigen, sondern mit ihren petrochemischen Pendants recycelt werden können.

I

b) A master science thesis titled "Production of Nanosilver Reinforced Biodegradable Polymer Coating Material Obtained by Green Synthesis Method" was completed by Hatice Elvan Erkan under the supervision of Arzum Işıtan and Mine Sulak at PAU Institute of Science and Technology.

YEŞİL SENTEZ YÖNTEMİYLE ELDE EDİLMİŞ NANOGÜMÜŞ TAKVİYELİ BİYOBOZUNUR POLİMER KAPLAMA MALZEME ÜRETİMİ

YÜKSEK LİSANS TEZİ

HATİCE ELVAN ERKAN

ÖNSÖZ

"Yeşil Sentez Yöntemiyle Elde Edilmiş Nanogümüş Takviyeli Biyobozunur Polimer Kaplama Malzeme Üretimi" konulu tez çalışması Pamukkale Üniversitesi Teknoloji Fakültesi Metalurji ve Malzeme Mühendisliği ve Biyomedikal Mühendisliği Laboratuvarlarında gerçekleştirilmiştir.

Tez çalışmam ve yüksek lisans öğrenim süresinde, bilgi birikimleri ve tecrübeleriyle bana yol gösterip ışık olan, yardımlarını esirgemeyen, beni motive eden saygıdeğer danışman hocalarım Doç. Dr. Arzum IŞITAN ve Dr. Öğrt. Üyesi Mine SULAK olmak üzere, bu süre içerisinde aynı şekilde bilgi ve tecrübesiyle yol göstererek bilgilerini benimle paylaşan, yardımcı olan Prof. Dr. Cem GÖK' e ve Prof. Dr. Ahmet KOLUMAN'a teşekkürlerimi ve saygılarımı sunuyorum. Bu tez çalışması fikri Türkiye Ulusal Ajansı tarafından desteklenen ve Pamukkale Üniversitesi'nin koordinatöre olduğu 2021-1-TR01-KA220-HED- 000032160 nolu "Let's use biodegradable plastic for the future/ FUTUREBIO" isimli proje kapsamında gerçekleştirilmiştir. Türkiye Ulusal Ajansı ve Erasmus+ programına teşekkür ederim.

Labratuvar çalışmalarımda Pamukkale Üniversitesi Teknoloji Fakültesi ve Pamukkale Üniversitesi İLTAM'da görev alan personollerine ayrı ayrı desteklerinden dolayı teşekkür ederim.

Bu tez çalışması Türkiye Ulusal Ajansı tarafından desteklenen ve Pamukkale Üniversitesi'nin koordinatör olduğu 2021-1-TR01-KA220-HED 000032160 nolu proje ile desteklenmiştir.

c) A patent application titled "NANO ZINC-OXIDE BORON DOPED BIODEGRADABLE POLYMER FIRE EXTINGUISHING BALL AND ITS PRODUCTION METHOD" was done by PAU team.

Buluş Bilgileri

Buluş Başlığı	NANO ÇİNKO-OKSİT BOR KATKILI BİYOBOZUNUR POLİMER YANGIN SÖNDÜRME TOPU VE BUNUN ÜRETİM YÖNTEMİ
Buluş Özeti	Buluş, yangın söndürme alanında özellikle açık hava yangınlarının kontrol altına alınması ve söndürülmesinde kullanılacak nano çinko-oksit bor katkılı biyobozunur polimer yangın söndürme topları ile ilgilidir. Buluş özellikle, doğadaki canlılara ve çevreye zararı çok büyük olan orman ve açık hava yangınlarının kontrol altına alınması ve söndürülmesinde kullanılacak, söndürücü madde olarak yeşil sentez yöntemi ile üretilen bor katkılı çinko oksit nanopartiküllerini içeren biyobozunur polimer yangın söndürme topları ve bunların üretim yöntemi ile ilgilidir.

EVRAKLAR | İNCELEME RAPORU | ARAŞTIRMA RAPORU

Başvuru Bilgileri

Başvuru Numarası	2023/006055	Başvuru Tarihi	26.05.2023
Başvuru Şekli	-	Evrak Numarası	2023-GE-330411
Evrak Tarihi	26.05.2023	Tescil Numarası	-
Tescil Tarihi	-	Koruma Tipi	Patent
EPC Yayın Numarası	-	EPC Başvuru Numarası	-
PCT Yayın Numarası	-	PCT Başvuru Numarası	-
PCT Yayın Tarihi	-		

Başvuru Sahipleri

Kişi No	İsim	Adres
6493423	PAMUKKALE ÜNİVERSİTESİ	PAMUKKALE ÜNİ REKTÖR LÜĞÜ İNCİLİPINAR - TÜRKİYE

Buluş Sahipleri

Kişi No	İsim	Adres
7512689	AHMET GÜL	- -
6334478	ARZUM IŞITAN	- -
7512696	AHMET AKİF SAYGIN	- -
7512694	CEM GÖK	- -
7512695	MİNE SULAK	- -
7512692	BEYZA KAHRAMAN	- -

d) Boca, G.D.; Işitan, A.; Çağlarer, E.; Saraçli, S. A Cross-Cultural Analysis for Plastic Waste Perception of Students from Romania and Turkey. Sustainability 2023, 15, 16594. https://doi.org/10.3390/su152416594

Author Contributions

Conceptualization, G.D.B., A.I., S.S. and E.Ç.; methodology, G.D.B., A.I., S.S. and E.Ç.; validation; G.D.B., A.I., S.S. and E.Ç.; writing—original draft preparation, G.D.B., A.I., S.S. and E.Ç.; writing—review and editing. All authors have read and agreed to the published version of the manuscript.

Funding

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Pamukkale University (protocol code E-93803232-622.02114625/18-14/07.10.2021) and Ethics Committee of Technical University of Cluj Napoca (CEU 515/20/03/2023).

e) BOCA, G. D., ISITAN, A., & ÇAĞLARER, E. (2023). A CROSS MODEL FOR ACADEMIC STAFF REGARDING BIO PLASTIC. Review of Management & Economic Engineering, 22(1). https://www.rmee.org/abstracturi/87/01_Articol_665_.pdf

Acknowledgment
This study has been prepared within the scope of the FutureBio project (Erasmus+ KA220-HED-Cooperation Partnerships in Higher Education) supported by the Turkish National Agency and EU. "Funded by the Erasmus+ Program of the European Union. However, European Commission and Turkish National Agency cannot be held responsible for any use which may be made of the information contained therein"

f) BOCA, G. D., & ÇAĞLARER, E. (2023). A CROSS MODEL FOR INDUSTRIAL WORKERS REGARDING BIOPLASTIC. Review of Management & Economic Engineering, 22(1). https://www.rmee.org/abstracturi/87/06_Articol_664_.pdf

Acknowledgment
This study has been prepared within the scope of the Future Bio project (Erasmus+ KA220-HED-Cooperation Partnerships in Higher Education) supported by the Turkish National Agency and EU. "Funded by the Erasmus+ Program of the European Union. European Commission and Turkish National Agency cannot be held responsible for any use which may be made of the information contained therein"

g) IŞITAN, A., Cem, G. Ö. K., Sulak, M., KIRMIZI, F., Volkan, O. N. A. R., & Kutlubay, R. Ç. (2022). Bioplastics and s/biopolymers: How aware are we?. Avrupa Bilim ve Teknoloji Dergisi, 36–414141. https://dergipark.org.tr/en/download/article-file/2481203

For this reason, the FutureBio project idea is developed, supported by the Turkish National Agency with project number 2021-1-TR01-KA220-HED-000032160 within the scope of Strategic Partnerships in the Field of Higher Education. FutureBio aims:

5. Acknowledge

FutureBio project is supported by the Turkish National Agency with project number 2021-1-TR01-KA220-HED-000032160 within the scope of Strategic Partnerships in the Field of Higher Education. The project is "Funded by the Erasmus+ Programme of the European Union. However, European Commission and Turkish National Agency cannot be held responsible for any use which may be made of the information contained therein".

Also, the following papers have been prepared and submitted to journals, and they are under peer review:

"Bioplastics Awareness Scale (BIYOF): Validity and Reliability"

"Production of Nanosilver Reinforced Biodegradable Polymer Coating Material Obtained by Green Synthesis Method"

2.11. Projects

a) The partnership wrote a new KA220-HED project as a continuation of FutureBio (TEXSUS project, Form ID KA220-HED-4B1062CA).

Call 2024 Round 1 KA2, KA220-HED: Cooperation partnerships in higher education (KA220-HED), Form ID KA220-HED-4B1062CA Deadline (Brussels Time) 05 Mar 2024 12:00:00, Innovation and sustainability of textile waste: Transformation to Biopolymers

Objectives: The project aims to promote environmental sustainability and advance the circular economy regarding textile waste, to raise awareness and knowledge among students, academics, industrial workers, and the public about sustainable textile recycling and biodegradable plastics production to reduce carbon emissions and environmental pollution by creating flexible and attractive training materials, as well as to increase the digital competencies of the entire target audience.

Implementation: TEXSUS uses advanced digital technologies (metaverse application) and pedagogical methods (curriculum, competence map, course book, open education resources, peer learning) to train the target group members, reducing environmental impact of textile waste and promoting a circular economy. For this purpose, 5 project meetings, 10 informational meetings, 1

congress, pilot application, online education week, social activities, and a LTT activity for students will be organized.

Results: TEXSUS expects to yield an informed community on sustainable textile recycling and bioplastics. Open Education Resources enhanced digital literacy as Metaverse tool, Curriculum, Competence Map, Course Book, Good Practice Examples' Videos, and How to Use Guide are outputs of TEXSUS. These outcomes aim to make positive contributions to education, foster a circular economy, reduce environmental impact, and pave the way for sustainable practices in the textile, bioplastics, and related industries.

b) A new consortium under the coordination of COSVITEC, including PAU and SUPSI, got a grant for a new project: FOOD CHASE Food Supply—Chain Ecosystems for Sustainability/ Food Chase (ERASMUS-EDU-2023-PI-ALL-INNO-EDU-ENTERP-101140250).

c) Within the scope of TUBITAK-2209-A UNIVERSITY STUDENTS RESEARCH PROJECTS SUPPORT PROGRAM, 2 undergraduate student projects were entitled to be supported in 2022 and 2023 under the supervision of project coordinator Arzum Işıtan.

1. Fire Extinguishing Rocket (Ahmet Gül and Arzum Işıtan)

The Summary of TÜBİTAK 2209-A Project/1

2209-A University Students Research Projects Support Program

APPLICATION NUMBER: 1919B012106054

PROJECT NAME: Fire Extinguishing Rocket

SUMMARY

A forest fire is the partial or total burning of forests by natural or human-caused fires. As global warming increases, so do forest fires and floods. Forest fires cause an increase in global warming and a decrease in biodiversity. Therefore, controlling and preventing forest fires is of great importance. In our country, forest fires are fought by land vehicles, helicopters, and airplanes. However, it is very difficult to intervene in forest fires that break out in large-scale and different areas at the same time, and forest loss increases. The extinguishing rocket project we have developed aims to intervene in fires in a short time and effectively, to help the personnel in charge by surrounding the forest fire with the chemicals that the rocket will throw into the fire, and to prevent the extinguishing process from damaging the natural area by producing the chemicals to be used from natural materials. Thus, new and advanced technologies will be used not only in space and aviation systems but also to protect our natural environments. A new chemical for fire extinguishing will also be developed within the scope of the project.

2. The Use of Doped Biopolymer Plastics in Different Fields (Kenan Semiz and Arzum Işıtan)

The Summary of TÜBİTAK 2209-A Project/2

2209-A University Students Research Projects Support Program

APPLICATION NUMBER: 1919B012301731

PROJECT NAME: Utilization of Doped Biopolymer Plastics in Different Areas

SUMMARY

After the modern world was introduced to polymer materials in the 1400s, the first synthetic polymer was obtained in the early 1900s, and different polymers started to be produced since the 1950s. Today, plastics and polymers have an important place in our lives. They have found a wide range of uses due to many reasons, such as their lightness, easy shaping, ability to be mixed with different additives and easily change their properties, and good corrosion resistance. Polymeric materials find a wide range of uses, from kitchen utensils to car bumpers, from chairs to artificial heart valves. However, polymeric materials are especially widely used in packaging (food, textiles, machinery, etc.). Plastic waste is an important part of solid waste disposed of in landfills. Most of these wastes are packaging plastics. Microplastics, which are small particles under 5 mm in size, are also a major problem. Their leakage and pollution are increasing day by day, and they are almost part of the food chain in the oceans.

Biodegradation of organic matter is the result of the activities of microorganisms such as fungi, yeasts, actinomycetes, and bacteria. As a result of our research, we studied the production of additive biocomposites with PLA matrix. It takes 450 years for plastics to disappear in nature, and about eight percent of the world's oil is used to produce plastic materials. In addition, when a plastic item is thrown into nature, it emits carbon emissions as it degrades. The European Commission published "A European Strategy for Plastics in the Circular Economy" and "Plastic Waste: A European Strategy to Protect the Planet, Defend Our Citizens, and Strengthen Our Industries." Reports published by the European Commission state that approximately 25.8 million tons of plastic waste are produced in the EU every year. Furthermore, the report "Preventing Plastic Waste in Europe 02/2019" reports that collected plastic waste is less than 30% of all plastic produced and that only 6% of plastic products in Europe are claimed to be recycled plastic. Around 99% of plastic materials are derived from petroleum-derived products. Worldwide, between 5 and 13 million tons of plastic are transported into the oceans annually. This amount is rising alarmingly as the amount of plastic waste produced each year increases.

In order to protect nature and living beings, the production of plastics using natural materials instead of petroleum products should increase and become widespread. This strategy includes actions related to compostable and biodegradable plastics. In this way, it is aimed at reducing plastic waste and our carbon footprint and degrading plastics quickly without harming nature by using materials derived from natural resources. With this project, we aim to contribute to all environmental methods developed, including the Green Deal.

d) Within the scope of TUBITAK-2209-A UNIVERSITY STUDENTS RESEARCH PROJECTS SUPPORT PROGRAM, 3 undergraduate student projects were entitled to be supported in 2023 under the supervision of the project coordinator of the Selçuk University Yasemin Öztekin:

Printing 3D Electrodes and Investigating the Effect of Surface Activation on Surface Properties (Neslihan ŞENTÜRK and Yasemin Öztekin)
Investigation of the Effect of CAD Application and FullControl GCode Designer on Electrode Properties in 3D Printing (Yasemin CÖMERT and Yasemin Öztekin)

Production of Reusable Wound Dressing Using Fused Deposition Modeling (FDM) with 4D Printing (Rahime ATİK and Yasemin Öztekin)

The Summary of TÜBİTAK 2209-A Project/3

2209-A University Students Research Projects Support Program

APPLICATION NUMBER: 1919B012219002

PROJECT NAME: Printing 3D Electrodes and Investigating the Effect of Surface Activation on Surface Properties

With the widespread adoption of 3D technology, 3D printers, which can be defined as machines used for designing a product in a computer-aided environment and printing the final product, have garnered significant interest. The proliferation of 3D technology has made 3D printers usable in many fields. The ability of 3D printers to provide a product designed in a virtual environment within hours or even minutes has eliminated the need for traditional methods involving machinery, equipment, and labor during production. Additionally, one of their most important advantages is their low production cost. Considering these advantages, the ability to obtain three-dimensionally printed working electrodes in a very short time and at a cost well below market values plays a significant role in making them preferable over ready-made electrodes used in electrochemical analyses.

In this study, the design and printing of three-dimensional electrodes, as well as the activation, modification, and characterization of surfaces, were planned. The effects of activation and electrochemical activation in the solvent on the morphological characteristics and electrochemical responses of surfaces modified with gold nanostructures were investigated by comparisons. Providing a comparative presentation of the effects of electrode activation and electrochemical activation in the solvent on surface properties constituted the primary objective and uniqueness of the study. At the end of the study, understanding of the operational principle of 3D printers, how surface activations of working electrodes were performed and determined to be completed, surface modifications, characterization of bare and modified surfaces, and creating awareness in activation processes were also among the objectives of the study. In line with these objectives, the study addresses Sustainable Development Goals: Goal 3: Good Health and Well-being, Goal 4: Quality Education, Goal 5: Gender Equality; Goal 6: Clean Water and Sanitation; Goal 8: Decent Work and Economic Growth; Goal 9: Industry, Innovation, and Infrastructure; Goal 12: Responsible Consumption and Production.

All stages of the project were conducted under the supervision of Prof. Dr. Yasemin ÖZTEKİN, a faculty member in the Department of Chemistry at Selçuk University; and were carried out by Neslihan ŞENTÜRK. Support was provided to the applicant by Yasemin CÖMERT, a second-year student in the Department of Chemistry at Selçuk University, for the design and printing of electrodes to be used in the project. A. Taha GÜLDEREN, a doctoral student in the Department of Nanotechnology and Advanced Materials at Selçuk University, was mentor Neslihan ŞENTÜRK on the content of the study, reporting, and 2209 project processes due to his knowledge. This study, which was conducted as a team effort within the research group, aimed to produce one publication.

The Summary of TÜBİTAK 2209-A Project/4

2209-A University Students Research Projects Support Program

APPLICATION NUMBER: 1919B012215607

PROJECT NAME: Investigation of the Effect of CAD Application and FullControl GCode Designer on Electrode Properties in 3D Printing

Additive manufacturing technology is widely accepted due to its design flexibility, various material options, and wide application areas. Fused deposition modeling, a type of additive manufacturing technology, which generally involves layer-by-layer addition of thermoplastic material to create a 3-dimensional object, thus enabling material savings, eliminating the need for molds, providing design flexibility even in complex parts, is used in a wide range of fields such as architecture, engineering, art, education, jewelry and accessories, and white goods components.

In this research project, electrode prints were obtained using the 3D printing technique, which is one of the additive manufacturing technologies. Electrode designs were realized separately using conventional computer-aided design (CAD application) and the newly introduced FullControl GCode Designer method. The surfaces of the electrodes designed and printed using different methods were coated with silver electrochemically. The bare electrode surfaces and the surfaces modified with silver were characterized using electrochemical and microscopic techniques. The evaluation was made regarding the effect of two different design methods applied in the 3D printing technique on both the preparation of modified surfaces and the contribution to the properties of the surfaces after modification. This study, being the first to present a comparative evaluation of two different design approaches used in electrode printing in terms of surface preparation and characterization, had high original value.

Among the objectives of the study were minimizing the environmental negative effects in scientific studies, highlighting female empowerment through work, creating awareness of teamwork among undergraduate students, and realizing the importance of economic and social contributions to society in scientific studies. In line with these objectives, the study addressed Goal 3: Good Health and Well-being; Goal 4: Quality Education; Goal 5: Gender Equality; Goal 6: Clean Water and Sanitation; Goal 8: Decent Work and Economic Growth; Goal 9: Industry, Innovation, and Infrastructure; and Goal 12: Responsible Consumption and Production, identified as Sustainable Development Goals in the 70th Session of the United Nations General Assembly in 2015 with active participation of UNESCO.

The study was conducted by Yasemin CÖMERT, a second-year student under the supervision of Prof. Dr. Yasemin ÖZTEKİN, a faculty member in the Chemistry Department of Selçuk University

The Summary of TÜBİTAK 2209-A Project/5

2209-A University Students Research Projects Support Program

APPLICATION NUMBER: 1919B012311004

PROJECT NAME: Production of Reusable Wound Dressing Using Fused Deposition Modeling (FDM) with 4D Printing

4D printing is the ultimate product obtained by the gradual reversal over time of the shape, properties, and functionality of a 3D printed structure when exposed to a predetermined stimulus such as heat, light, pH, etc. Essentially, 4D printing stems from the rapid advancements in smart materials and designs, as well as the interdisciplinary use of 3D printers. Currently in its infancy, 4D printing has become an exciting branch of additive manufacturing and is drawing significant interest from academia and industry across various disciplines. The use of 4D printing in various fields such as healthcare, biomedicine, textiles, aviation, construction, infrastructure, and more holds promise for the future. Given its current relevance, every contribution to 4D systems is deemed important, thus a project proposal titled "Production of Reusable Wound Dressing Using Fused Deposition Modeling (FDM) with 4D Printing" was being presented by a 2nd-year undergraduate student of the Department of Chemistry, Faculty of Science, Selçuk University. The proposed study was conducted by Rahime ATİK under the supervision of Associate Professor Yasemin ÖZTEKİN from the Department of Chemistry, Faculty of Science, Selçuk University. The aim of the proposed study was to investigate the sustainable and recyclable use of a wound dressing designed utilizing the shape memory property of PLA via the FDM method. The workflow included designing the sample using CAD application, slicing it at appropriate parameters using Ultimaker Cura, printing the wound dressing sample with PLA filament and FDM method, preparing a mixture with desired physical properties and sterilization capabilities, subjecting the 3D printed wound dressing to physical interactions with external stimuli, and characterizing the surfaces. While the steps of 3D design and printing have been ongoing for over a year under the guidance of Associate Professor Yasemin ÖZTEKİN's Research Group, the study hold high originality value in terms of the final product and subsequent planned works. Considering the originality of the study, the aim was to publish it in an international journal and further develop the idea of a 4D reusable wound dressing to the R&D level. The proposed study was an output of the ERASMUS+ project titled "Let's Use Biodegradable Plastic for the Future-FutureBio" with the project number 2021-1-TR01-KA220-HED-000032160, in which Selçuk University was a partner.

e) Project coordinator Assoc. Prof. Dr. Arzum Işıtan has been awarded a post-doctoral fellowship with the project titled "Investigation of Mechanical and Thermal Properties of PLA Matrix Biocomposites Reinforced with Micro and Nanocrystalline Cellulose from Waste Textile Products" submitted within the scope of TÜBİTAK-2219 INTERNATIONAL POSTDOCTORAL RESEARCH FELLOWSHIP PROGRAM. She will be at the BRUNO KESSLER FOUNDATION under the supervision of Dr. Massimo Bersani from March 2024 to March 2025 for her postdoctoral studies. In this context, FutureBio has paved the way for new collaborations and new scientific and industrial studies.

2.12. Press Releases and Interviews

Nadia Catenazzi from SUPSI published an article titled "The FUTUREbio project - Open Educational Resources creation in H5P" on the EPALE platform:https://epale.ec.europa.eu/en/content/futurebio-project-open-educational-resources-creation-h5p

EPALE > Contribute > News > The FUTUREbio project – Open Educational Resources creation in H5P

News 28 February 2024

The FUTUREbio project – Open Educational Resources creation in H5P

Nadia Catenazzi

The ERASMUS+ FUTUREbio project (Let's use biodegradable plastic for the future, https://www.futurebioproject.eu/) has been successfully completed!

Its main objective is to raise awareness about plastic pollution and biodegradable products, through the creation of different training material, including a lecture guidebook, interactive educational resources, laboratory videos and virtual reality exercises.

This news focuses on interactive educational resources, which were created using H5P (https://h5p.org/), which allows anyone to create engaging cross-browser and cross-platform interactive content such as presentations, videos, quizzes, games and more, without the need for programming skills. H5P also provides easy integration with existing content management systems and provides support for collaborative authoring.

Within the project, the interactive content creation was quite complex since it involved different actors in different countries: content authors, technology experts and people responsible for translation. Therefore, a

Some written and visual press links with the news of the project:

https://www.yok.gov.tr/Sayfalar/Haberler/2023/yesilin-ve-geri-donusumun-adresi-universiteler-karbon-ayak-izlerini-azaltiyor.aspx

https://www.yenibakis.com.tr/paunun-yurutuculugunu-yaptigi-futurebio-projesi-2024-yilinda-tamamlanacak

https://www.iha.com.tr/denizli-haberleri/futurebio-projesi-2024-yilinda-tamamlanacak-42976316

https://www.genccivrilgazetesi.com/futurebio-projesi-italyanin-ev-sahipliginde-gerceklesti

https://www.denizli24haber.com/haber/paunun-yuruttugu-futurebio-projesinin-acilis-toplantisi-gerceklestirildi-46021

https://kirklareliataturkio.meb.k12.tr/icerikler/futurebio-asamblaj-calismasi_14091760.html

https://www.marmarahaber.com.tr/haber/ozefsunu_kapanis_toplantisina_davet_etti_-87074.html

https://kirklarelicumhuriyetortaokulu.meb.k12.tr/icerikler/5-haziran-cevre-gunu-futurebio-resim-yarismasinda-cesitli-dereceler-elde-ettik_14090413.html

https://www.iha.com.tr/denizli-haberleri/-3421499

https://www.turkchem.net/futurebio-projesi-desteklenmeye-hak-kazandi.html

https://byhi.klu.edu.tr/Sayfalar/30984-universitemizde-uluslararasi-katilimli-plastik-endustrisinde-surdurulebilirlik-ve-biyoplastikler-paneli-duzenlendi.klu

https://www.haberaydin.com/haber/17647696/futurebio-projesi-2024-yilinda-tamamlanacak

https://yenigazetem.net/futurebio-projesi-2024-yilinda-tamamlanacak/

https://haber.pau.edu.tr/haber/futurebio-projesi-kapsaminda-italyada-ogrenci-ogrenim-faaliyeti-gerceklestirildi

https://haber.pau.edu.tr/Haber/paunun-yuruttugu-futurebio-projesinin-acilis-toplantisi-gerceklestirildi

https://pgko.klu.edu.tr/Sayfalar/22556-haydi-gelecek-icin-biyobozunur-plastik-kullanalim-lets-use-biodegradable-plastic-for-the-future--futurebio-projesi-erasmus-ka220-hed-kapsaminda-turkiye-ulusal-ajansi-tarafindan-desteklenmeye-hak-kazanmistir.klu

https://haber.pau.edu.tr/haber/futurebio-projesi-kapsaminda-italyada-ogrenci-ogrenim-faaliyeti-gerceklestirildi

https://www.denizliekspres.com.tr/pau-nun-yuruttugu-futurebio-projesi-nin-acilis-toplantisi-gerceklestirildi/38155/

https://www.trakyagazetesi.com.tr/kirklarelinde-resim-ve-asamblaj-yarismasi

https://www.denizliekspres.com.tr/futurebio-projesi-desteklenmeye-hak-kazandi/35426/

https://tf.klu.edu.tr/Sayfalar/30685-mekatronik-muhendisligi-ogrencilerimiz-italyada-egitim-aldi.klu

https://magazine.fbk.eu/en/news/educa-2023-new-alphabets-lets-build-together-the-lexicon-of-the-future/

"European Union Supported Digital Farmer and FutureBio Projects from PAU" interview:

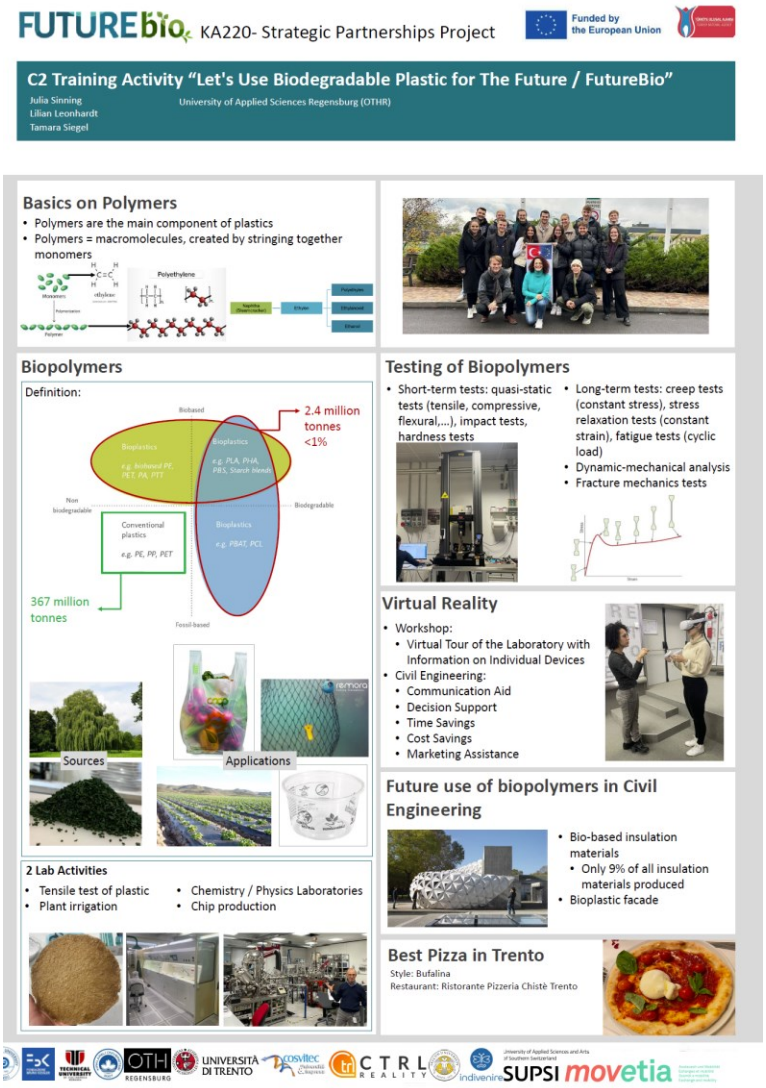
“We talked about the "Digital Farmer" and "Future Bio" projects in which Pamukkale University is a stakeholder with Assoc. Prof. Dr. Arzum Işıtan, who is a faculty member of Pamukkale University Faculty of Technology, Department of Mechanical Engineering, advisor of our Teknokent teams Hazar Rocket Team, Ulaş Rocket Team and Umay Çırpan Kanat UAV Team and coordinator, member, and team member in 6 Erasmus+ projects.”

https://www.youtube.com/watch?v=jkpT3_0MKwk

2.13. Congress/ Symposium / Seminars

- Two students from SU attended the 12th Eagean Analytical Chemistry Days congress held in Istanbul/Turkey with poster presentations. The content of the poster presentations is the use of PLA printed in the form of electrodes in 3D printing in various chemical processes.Their work was supported by Tübitak, and Futurebio was referenced in poster presentations and project reports.

- A seminar titled "Biodegradable Plastics and possible applications of VR as well as biopolymers in the construction sector" has been realized as a poster presentation by OTH on December 15, 2023, at Regensburg.



➢ An oral presentation titled "Ressource-efficuent structures" has been done at 21st international conference on constructions materials onSeptember 3. - 15.September 2023, at Weimar, Germany by OTH as oral presentation.

21st International Conference on Building Materials

ibausil
www.ibausil.de

Certificate of Attendance

Conference Host:
F. A. Finger-Institut für Baustoffkunde der Bauhaus-Universität Weimar

Chair of the Conference Committee:
Prof. Dr.-Ing. Horst-Michael Ludwig

Secretary of the Conference Commitee:
Dr.-Ing. Matthias Lieboldt

Conference Organiser:
Bauhaus Weiterbildungsakademie Weimar e.V.
Carolin Rollnik

This is to certify that

Prof. Dr. Charlotte Thiel

participated in the 21st International Conference on Building Materials in Weimar, Germany from 13 - 15 September 2023.

H.-M. Ludwig

Prof. Dr.-Ing. Horst-Michael Ludwig
Chair of the Conference Committee

Weimar, 26 September 2023

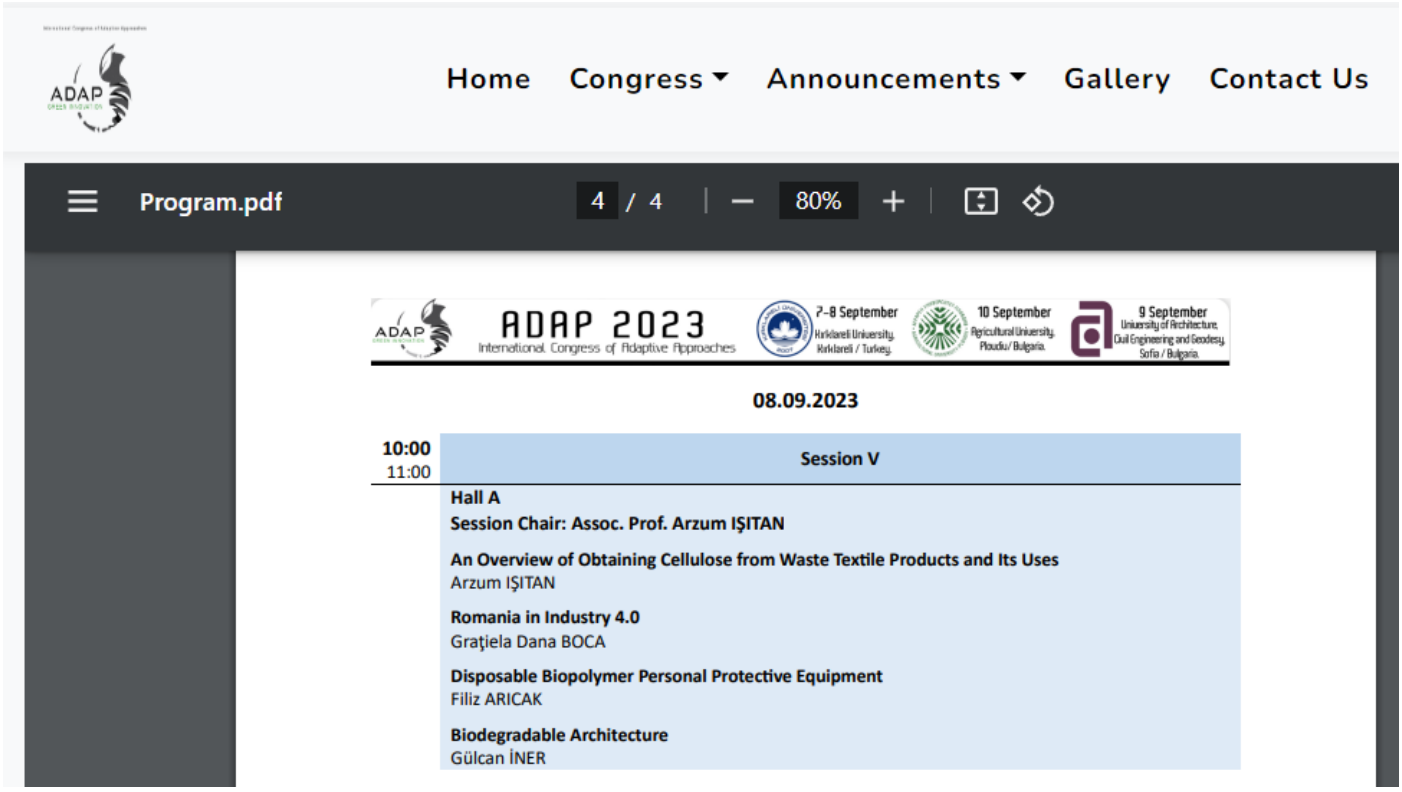
- A virtual workshop titled "Sustainable Structures - Potentials of Biopolymers" has been realized by OTH on 7th February 2024.

- "International Congress on Adaptive Approaches - ADAP 2023" was held on September 7-10, 2023 in partnership with Kırklareli University, Turkey, Agricultural University of Plovdiv, Bulgaria

and Sofia University of Architecture, Civil Engineering and Geodesy, Bulgaria. FutureBio team participated in the congress with two sessions:

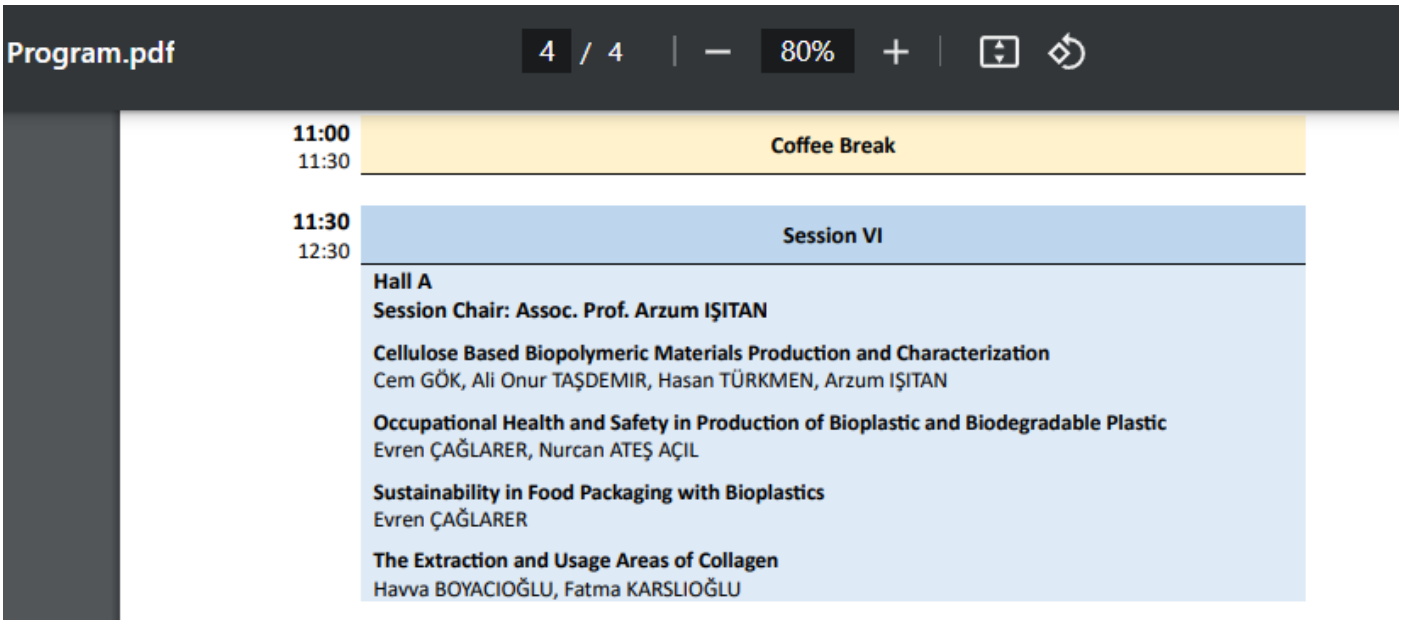
Session Chair: Assoc Prof. Dr. Arzum IŞITAN

- Arzum IŞITAN "Obtaining Cellulose from Waste Textile Products and an Overview of its Uses"
- "Romania in Industry 4.0" by Graţiela Dana BOCA
- "Disposable Biopolymer Personal Protective Equipment" by Filiz ARICAK
- "Biodegradable Architecture" Author Gülcan İNER



Session Chair: Assoc Prof. Dr. Arzum IŞITAN

- “A Cellulose Based Biopolymeric Materials Productioon and Characterization” by Cem GÖK, Ali Onur TAŞDEMIR, Hasan TÜRKMEN, Arzum IŞITAN
- “Occupational Health and Safety in Production of Bioplastic and Biodegradable Plastic” by Evren ÇAĞLARER, Nurcan ATEŞ AÇIL
- “Sustainability in Food Packaging with Bioplastics” by Evren ÇAĞLARER
- “The Extraction and Usage Areas of Collagen” by Havva BOYACIOĞLU, Fatma KARSLIOĞLU



2.14. Multiplier Events

FutureBio project has 7 National informative meetings (E1, E2, E3, E4, E5, E6, and E7). At least 315 people were expected to attend those meetings.

a) National Information Meeting 1: Within the scope of our Futurebio project, at the beginning of the project, we held an online meeting with Mr. Hacı Çağatay, Board Member of Turkish Recyclers Confederation. We would like to thank him for his interest and ideas for possible collaborations.

In May 2022, PAGEV was contacted and consulted on plastics and bioplastics production in Turkey and future studies.

The first of the information meetings was the National Information Meeting 1 organized by PAU in Denizli on 02/2024. It was organized to share all project results and increase the recognition of the project. In the seminar prepared for high school students, Denizli Erbakır Science High School was visited. 110 students and 10 teachers were introduced to the project and students were able to see the effects of plastic pollution and laboratory environments with VR glasses.

The second of the information meetings, the Aegean Region Career Fair 2024 (EGEKAF'24), one of the career fairs organized under the auspices of the Presidential Human Resources Office, was held on February 21 and 22 (Wednesday and Thursday) at the Nihat Zeybekci Congress Cultural Center in Denizli. The project was introduced to 250 people from different education levels and business and universities one-to-one and VR tools were tested.

Within the scope of the Community Service course given by Prof. Dr. Fatma Kırmızı from Pamukkale University project team, Osman Özgür primary school was visited in May 2022. The activity

was attended by 10 undergraduate students, 32 primary school students, and 1 teacher. Students were given information about recycling, and they drew pictures related to the subject.


YAĞMUR
BAL
4/G
GEAT DENİZLİ
ATIK KUTUSU

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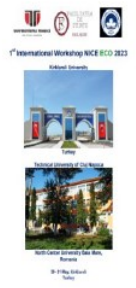
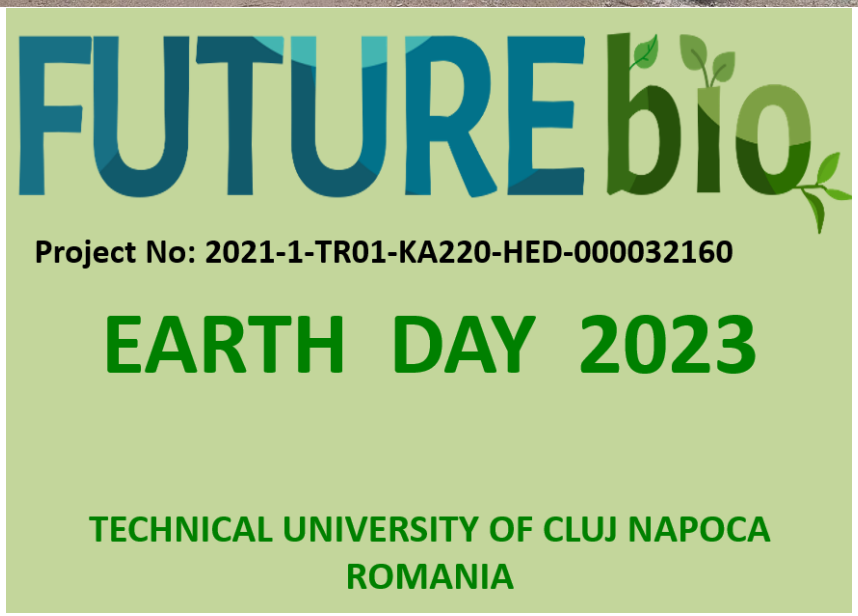
b) National Informative Meeting 2: The second one is National Informative Meeting 2 which has been planned to be held in Bae Mare, Romania on 11/2023 by UTCluj. UTCluj have prepared a lot of activities for the dissemination of FutureBio project:

List of Dissemination Activities						
Name of the Activity	**Partner**	**Date of the Activity**	**Place of Activity**	**Attendance Type**	**Name of the Presentation**	**Photo**
PANEL	UTCLUJ	14 May 2022	UTCluj CUNBM Baritiu College	Baia Mare Romania	**Informative meeting**	
PANEL	UTCLUJ	20 May 2022	UTCluj CUNBM	Baia Mare Romania	**Informative meeting**	
PANEL	UTCLUJ	June 2022	UTCluj CUNBM	Baia Mare Romania	**Informative meeting**	
International Symposium EICU 2023 http://eicu.ubm.ro/	UTCLUJ	June 2023	Baia Mare Romania	Workshop	**FUTURE VISION 4.0**	
Panel Green week http://eicu.ubm.ro/	UTCLUJ	May 2023	Baia Mare, Romania	Panel	**GREEN WEEK**	
Earth Day 2023	UTCLUJ	September 2023	Baia Mare Romania	Cleaning action	**EARTH DAY 2023**	 

International Workshop ECO NICE http://eicu.ubm.ro/	UTCLUJKirklarelei Turkey	May 2023	Hybrid	Workshop	ECO NICE		

In 2022 and 2023, the project and project results were presented to 634 external organizations and 68 UTCluj students in different activities in 2022.



1st International Workshop NICE ECO 2023

Kirklareli University

Turkey

Technical University of Cluj Napoca

North Center University Baia Mare, Romania

30- 31 May, Kirklareli Turkey

PROGRAMME
NICE ECO 2023

30 May 2023: KEYNOTE SPEAKERS

10.00 – 10.30	*Opening Ceremony*

Keynote Speaker
10.30-11.00

Assoc.Prof.. Dr. Arzum ISITAN
Pamukkale University, Denizli
Turkey

Keynote Title:

Waste plastic management in industrial manufacture

Keynote Speaker
11.00-11.30

Assoc. Prof. Dr. Evren ÇAĞLARER
Kirklareli University
Turkey

Keynote Title:

Waste plastic management in medical field

SECTION 1

PAPER	TIME	SESSION CHAIR	
		Assoc.Prof.Dr.Francesco GENOVESE Università degli Studi della Basilicata, Italy	
1	14.00-14.20	The public debt in Albania and its role in the economic development of the country	Klodian MUÇO
2	14.20-14.40	Impact of video games in medicine	Evren ÇAĞLARER
3	14.40-15.00	A cross model for industrial workers regarding bio plastic	Gratiela Dana BOCA , Evren ÇAĞLARER
BREAK			

SECTION 2

PAPER	TIME	SESSION CHAIR	
		Assoc.Prof.Dr.Antonio Gennaro GATTO Università degli Studi della Basilicata, Italy	
4	15.30-15.50	A cross model for academic staff regarding bio plastic	Gratiela Dana BOCA , Arzum ISITAN Evren ÇAĞLARER
5	15.50-16.10	Quality tools used to improve waste plastic	Gulcan INER Gratiela Dana BOCA ,
6	16.10-16.30	Increasing online shopping in the covid-19 period and health effect on couriers	Selma GEZGİN Evren ÇAĞLARER Iliz ARICAK
END OF SESSION			

Economie-Inovaţie-Comunicare-Universitară

16 th INTERNATIONAL SYMPOSIUM WORKSHOP

FUTURE 4.0 VISION

EICU

Economy-Innovation-Communication-University

YEAR 14 NUMBER 18 JUNE 2023

1

ECONOMY- INNOVATION- COMMUNICATION- UNIVERSITIES
E.I.C.U.

SCIENTIFIC COMMITTEE

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Ahmet AKTURK, Alanya Business Faculty, Turkey
Anna BAGINSKA, The State Higher School of Computer Science and Business Administration in Lomza, Poland
Anna GRABSKA, The State Higher School of Computer Science and Business Administration in Lomza, Poland
Antonio Gennaro GATTO, Università degli Studi della Basilicata,Potenza, Italy
Armağan ÖRKİ, Istanbul Rumeli University, Turkey
Arzdar KIRACI, Baskent University, Turkey
Arzu YAKAR, Pamukkale University, Turkey
Arzum ISITAN, Pamukkale University, Turkey
Ayhan EROL, Afyon Kocatepe University, Turkey
Azeta TARTARAJ, "Aleksander Moisiu" University, Albania
Besmira LACKU, FASTIP, Albania
Blerim KOLA, "Aleksander Moisiu" University, Albania
Cem GÖK, Pamukkale University, Turkey
Domenico CONSOLI, "Carlo Bo" University, Urbino, Italy
Dorian KRISTIQI, "Aleksander Mosiu" University, FASTIP Faculty, Albania
Elma MEMA, "Aleksander Moisiu" University, Albania
Engin ŞAHİN, Istanbul Rumeli University, Turkey
Erjon DUKA, FASTIP, "Aleksander Moisiu" University, Albania
Ermira KOLA, "Aleksander Moisiu" University, Albania
Ersida TELITI, "Aleksander Moisiu" University, Albania
Ervin MYFTARAJ "Aleksander Moisiu" University, Albania
Evren ÇAĞLARER, Kirklareli University, Turkey
Ezgi GÜREL, Afyon Kocatepe University, Turkey
Fadime OKAY, Afyon Kocatepe University, Turkey
Fatih Turan YAMAN, Istanbul Rumeli University, Turkey

4

c) National Informative Meeting 3: The third one is National Informative Meeting 3 which has been held in Turku, Finland on 11/2023 by CTRL Reality.

NETINVET

PROGRAMME

TTS Työtehoseura

EDUCATIONAL DAY AND JOB SHADOWING SEMINAR:

Date	Activity	Activities	Location	Visit	Timing
15th November 2023	Educational Day and Job Shadowing Seminar	Presentations and workshops, i.e. hands-on activities	Rälssitie 13, Vantaa, Finland	Vantaa Vocational College (Varia)	13:30 – 18:00

Logistical Details

Meeting point: in in the main entrance of Vantaa Vocational College (Varia), Rälssitie 13, Vantaa
Expected Participants: participants in the Retail, International Trade and Transport & Logistics visits are expected to attend this Seminar; Other participants are welcomed to join the Seminar (ex : participants in the commercial vehicle mechanics activities)
Organisation: presentations and workshops from 14h45 on will take place in parallel rooms.

Timing	Activities	Host / Teachers
13:30	Registration	
14:00	Opening session	Heidi Siren-Karetie, Vantaa Vocational Collage Varia Pirita Niemi, TTS Työtehoseura Peter Smith, Deltion College
14:10	Funding opportunities for E+ development projects	Outi Lindroos, Erasmus+ Programme Specialist Finnish National Agency for Education
	Coffee available "take away" style when changing into Workshop rooms	

	Presentations	Workshop 1	Workshop 2	Workshop 3
14:45	Experiences of preparing for the advent of artificial intelligence, case TTS Työtehoseura	Using -live-simulation in vocational education - Pilot with Varia / Video presentation	Meet me at VROOM! A VR-environment in SPATIAL, for beginners / VRinVET	A training concept for training C95 trainers to ensure quality training for professional drivers / ProC95Trainer
15:15	The practical learning at remote in the transport sector / PraLe	The card game on European social regulations "Master of Transport" and "Seal the Deal" escape game for transport sector. / e-ManTRA	Presenting and involving participants in the use of the method "Six thinking hat" / SUSTAIN4VET	How to make an escape room in OneNote
15:45	Using modern technology to train practical skills remotely in the transport sector			4 didactical ways to use MS PowerPoint

16:15	The use of modern digital equipment and software enables high-quality teaching at a distance. OneWorld Mixed Reality / On-line presentation	VR Tools to train biodegradable plastics / FutureBio CTRL Reality	Virtual mobility in the VET system / automotive & truck repair area	Chat GPT/AI for beginners
17:00	Feedback from the event using Menti questions and closing the day			

More Information & Contact Persons:

Heidi Siren-Karetie heidi.sirenkaretie@eduvantaa.fi

Pirita Niemi Pirita.niemi@tts.fi

Peter Smith psmith@deltion.nl

The project results were shared at the dissemination event held in Turku on November 15, 2023 and February 2024 as part of EDUCATIONAL DAY AND JOB SHADOWING SEMINAR.

d) National Informative Meeting 4: The fourth one is National Informative Meeting 4 which has been held in Naples, Italy on 11/2023 by Cosvitec. Followings are the details:

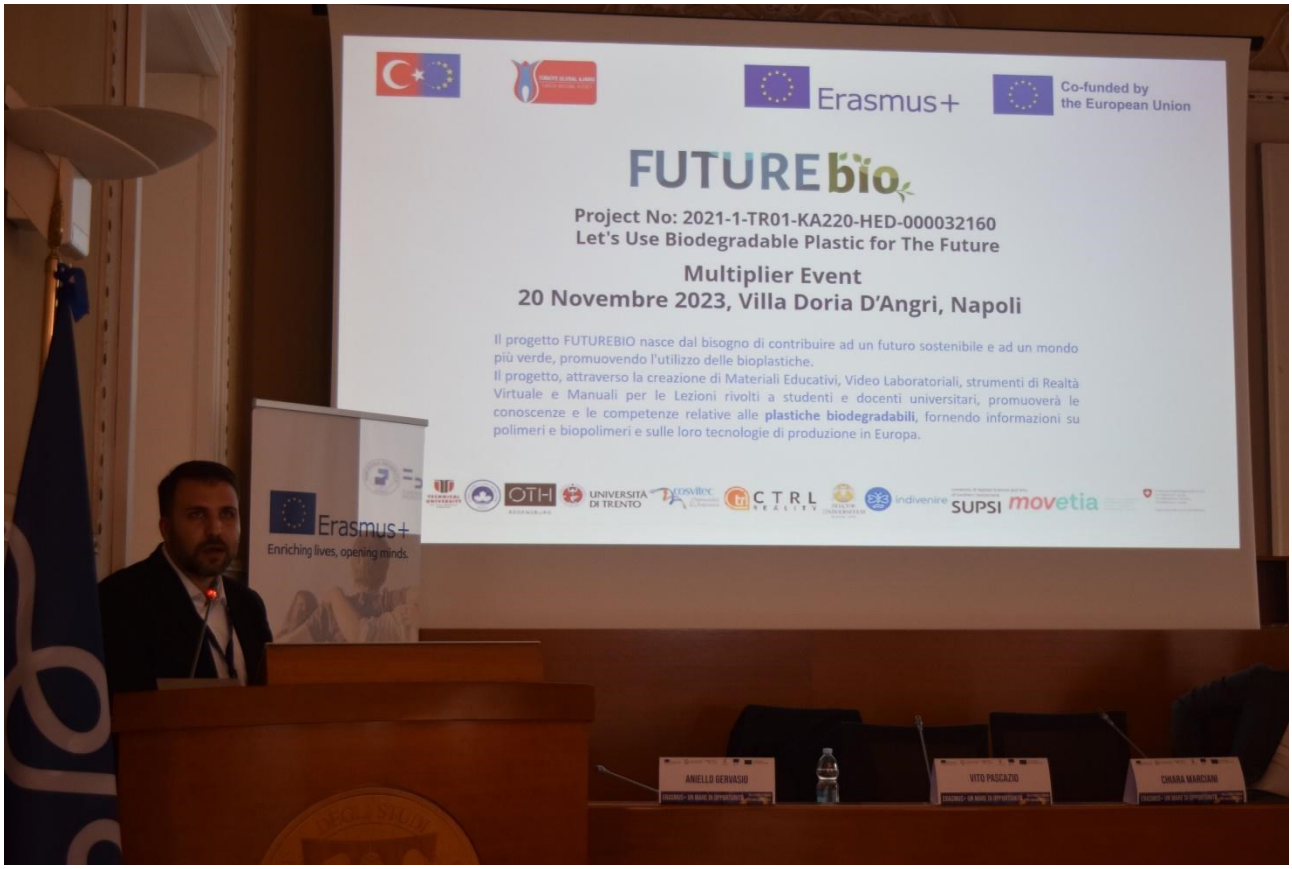
1. Activity name: Italian Multiplier Event
2. Activity date: November 20, 2023
3. The place where the activity is held: Villa Doria D'Angri, Naples, Italy
4. Number of participants: 60+ Participants

The multiplier event organized by Cosvitec Scarl was held on November 20, 2023, in Naples, Italy.

The more than 60 participants were university students, university teachers, VET school students, teachers, and headmasters.

During the event, we presented the project Futurebio, it's objectives, the completed project results, and all of the activities realized during the project's implementation. For the project outputs not yet finalized, we presented the contents realized thus far, and invited the participants to follow our project social media pages and the project website in order to stay updated on the project progress.

The overall feedback was positive, in particular among the VET school students and teachers, since the project is focused on a very important subject such as bioplastics and the importance of using biodegradable plastics to reduce plastic pollution and combat climate change.

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2021-1-TR01-KA220-HED-000032160
FUTUREBIO-LET'S USE BIODEGRADABLE PLASTIC FOR THE FUTURE
FUTUREbio
REGISTRAZIONE


Erasmus+
Co-funded by the European Union
Materiali Educativi
Strumenti VR
FUTUREbio
Lab Videos
Guida Alle Lezioni
SUPSI movetia


Erasmus+
Co-funded by the European Union
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FUTUREbio
Lab Video
Guida Alle Lezioni
SUPSI
movetia

e) National Informative Meeting 5: The fifth one is National Informative Meeting 5 which has been held in Konya, Turkey on 11/2023 by SU.

List of Dissemination Activities						
Name of the Activity	Partner	Date of the Activity	Place of Activity	Attendance Type	Name of the Presentation	Photo
12th Aegean Analytical Chemistry Days 2023	SU	19-22 October 2023	İstanbul, Turkey	Poster Presentation	3D Printing of Electrodes And Investigation of The Effect of Surface Activation on Surface Properties	

12th Aegean Analytical Chemistry Days 2023	SU	19-22 October 2023	İstanbul, Turkey	Poster Presentation	Investigation of The Effect of Different Design Routes in 3D Printing on Electrode Properties	
Informative Meeting	SU	4 December 2023	Konya, Turkey	Informative Meeting	Informative Meeting	

Seminar	SU	16 june 2023	Konya, Turkey	Seminar	Bioplastics for a Sustainable Green Environment	
Seminar	SU	16 june 2023	Konya, Turkey	Seminar	Bioplastic Production from Olive Pit	

f) National Informative Meeting 6: The sixth one is National Informative Meeting 6 which has been held in Trento, Italy on 11/2023 by FBK, UNITN, and IND.

With Giulia Fredi (UNITN) and Massimo Bersani (FBK) a seminar has been held about scientific research, the history of plastics, the importance of bioplastics, the difference about biodegradability and compostability, the importance of sustainability and the dangers of greenwashing. The seminar was held by **Giulia Fredi and Massimo Bersani** in ***four secondary schools*** in Trentino, for a total of 90 students.

1) Name of the school: Liceo Scientifico Galileo Galilei (Trento, TN, Italy)

Date: 21/11/2022

Number of students: 25

2) Name of the school: Liceo Scientifico Leonardo da Vinci (Trento, TN, Italy)

Date: 30/11/2023

Number of students: 20

3) **Name of the school: Gardascuola Istituto Comprensivo Paritario (Arco, TN, Italy)**

Date: 11/12/2023

Number of students: 25

4) Name of the school: Istituto di Istruzione Marie Curie (Pergine, TN, Italy)

Date: 05/12/2023

Number of students: 20

Fondazione Bruno Kessler, Universita Degli Studi Di Trento, Fondazione Bruno Kessler, Universita Degli Studi Di Trento, and Indivenire srl participated in EDUCA: TOWARD A NEW SCHOOL (education festival) event held in Rovereto/Italy on 14/16 Aprile 2023 with 13 posters.

EDUCA 14-16 April 2023, Rovereto (TN), Italy

Permanent exhibition

"Life and death in the Antropocene"

with Massimo Bersani, Nora Bonora, Piero Roggero, Alessandro Pegoretti, Giulia Fredi, Laura Pasquardini, Arzum Ulukoy

An unusual journey on the relationships with the environment and between people, of the meaning of innovation and development of ecologically defined, collective and global health, with the aim of promoting an extended concept of community where children and young people and their families are the basis of a new ecological thinking.

Attendance: several people and 14 participated at a questionnaire.

Curatori delle mostra:

Fondazione Bruno Kessler Massimo Bersani; **Arkè** Nora Bonora; **Università degli uomini&donne e della terra (UDT)** Piero Roggero; **Università di Trento** Alessandro Pegoretti e Giulia Fredi; **Indivenire** Laura Pasquardini **Pammukale University** Arzum.

FUTUREbio

https://futurebioproject.eu/it#ev

Vita e Morte

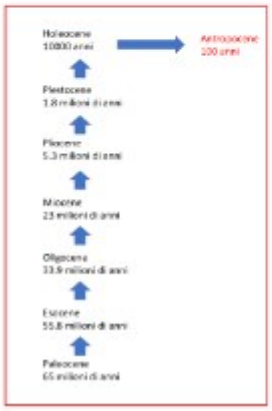
nell'Antropocene

EDUCA	FBK, UNITN, IND	14-16 April 2023	Rovereto, Italy	Poster Presentation	Exhibition	

FUTUREbio

Vita e morte nell'Antropocene

Massimo Bersani; Laura Pasquardini; Creuzimar Araújo dos Santos; Arzum Işıtan



"Il presente è condizionato dalle tracce accumulate del passato, e il futuro della terra porterà i segni del nostro presente. Mentre l'industria della plastica distrugge gli archivi della vita sulla terra, i suoi rifiuti costituiranno gli archivi del Novecento e oltre."

Bernadette Bensaude-Vincent

Più di 20 anni fa, il premio Nobel Paul Crutzen fu il primo a suggerire (che stiamo vivendo in una nuova era cenozoica post-olocene, che ha soprannominato "Antropocene", in cui gli esseri umani dominano la geologia e gli ecosistemi della superficie terrestre modificandoli in modo "geologico".

Fra 1 milione di anni le uniche tracce probabili che rimarranno dell'uomo sulla terra saranno i suoi rifiuti e l'inquinamento indotto.

L'uomo modifica e condiziona l'ambiente l'atmosfera e le alter forme viventi del pianeta e la plastica è alla base di questo condizionamento.

Non solo la plastica stessa viene utilizzata per porre rimedi estemporanei all'impatto dell'uomo sul clima.

Nel 2007 alcuni laghi della California furono coperti da palloni di plastica nera per evitare l'eccessiva evaporazione di questi laghi e l'eccessiva concentrazione di composti a base di bromuro.

Un azione similare è stata, recentemente, condotta nelle montagne del Trentino dove vari ghiacciai, sono stati avvolti in teli di plastica, durante l'estate, per limitarne lo scioglimento.

Ghiaccio del Rodano ricoperto da teli di plastica

La plastica non solo ha invaso i nostri ecosfera, ma è già penetrata nella struttura geologica del pianeta, modificando la geosfera stessa. Nell'isola di Trindade in Brasile le rocce si sono mischiate alla plastica creando un nuovo tipo di conglomerato.

Forse la specie umana è destinata ad estinguersi in un futuro non troppo lontano. Dobbiamo porre però le basi per impostare un'eredità diversa per il nostro pianeta e per le specie che verranno.

Per fare ciò la sola tecnologia non basta ma sere un paradigma di aziona basato su nuove forme di partecipazione individuale e pratiche collettive.

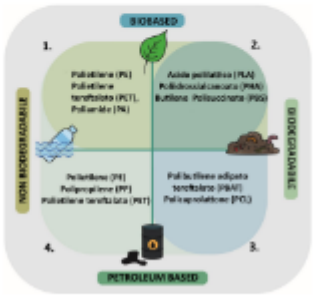
Conglomerato di plastica e rocce

indivenire

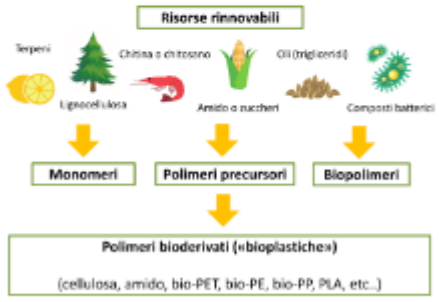
FUTUREbio

Biopolimeri: un'alternativa sostenibile

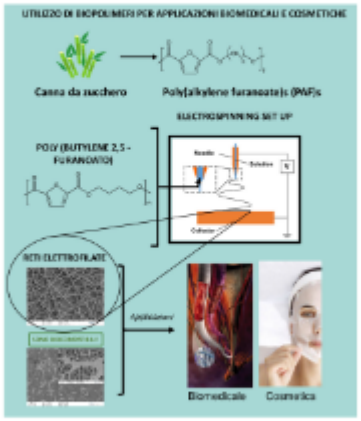
Sofia Santi, Alessandro Sorze, Edoardo Zonta, Giulia Fredi



1. Biobased ✓ Biodegradabile X
2. Biobased ✓ Biodegradabile ✓
3. Biobased X Biodegradabile ✓
4. Biobased X Biodegradabile X



Esempi di ricerca presso il Laboratorio di Polimeri e Compositi (Dip. Ing. Industriale, Università di Trento)



Also on Saturday morning there were two workshops involving FBK: **Davide Azzolini** of FBK-IRVAPP took part in the **debate** organized by **ISPAT "Young people in Trentino between school and work**," while **Massimo Bersani** participated in organizing the **workshop "Se dico acqua..."** to raise awareness for a more responsible management of an increasingly limited and precious resource.

Finally, throughout the three days of the festival, the exhibitions with the comic strip panels " Entropia!" at Palazzo Piomarta and **12 posters created as part of the Future Bio project**, also curated by **Massimo Bersani**, on the theme of sustainability remained on display along Corso Bettini.

https://magazine.fbk.eu/en/news/educa-2023-new-alphabets-lets-build-together-the-lexicon-of-the-future/

Teaching activities in FBK with David Novel, *Massimo Bersani, Laura Pasquardini*

Date: 31/03/2023

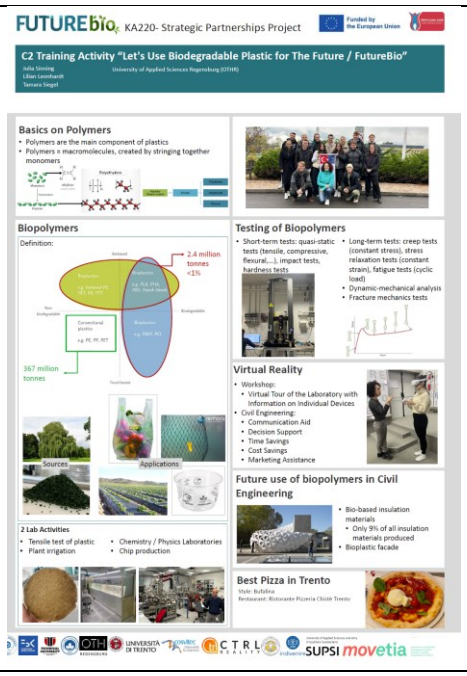
Number of students: 40

Two different classes of student of secondary schools in Trento were hosted in FBK to have a practical training on the use of scanning electron microscopy for the morphological and chemical characterization of different materials.

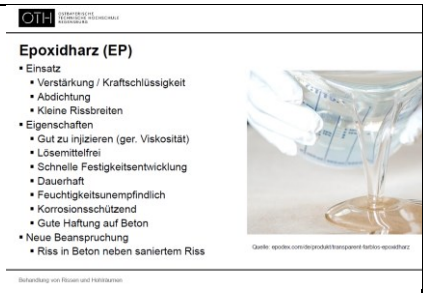
g) National Informative Meeting 7: The seventh one is National Informative Meeting 7 which was held in Regensburg, Germany, on 02/2024 by OTH.

Workshop	OTH	7th February 2024	online	Virtual Workshop	Sustainable Structures - Potentials of Biopolymers	

In addition, the following multiplier events were organized by OTH Regensburg:

Seminar	OTH	15 December 2023	Regensburg	Poster Presentation	Biodegradable Plastics and possible applications of VR as well as biopolymers in the construction sector	

(Here, more than 100 students attended and fruitful discussions were held.)

Workshop	OTH	14 June 2023	Regensburg, Germany	Interactive Workshop with oral presentations	Advanced Building Materials	

21st international conference on constructions materials (Ibausil)	OTH	13. - 15.September 2023	Weimar, Germany	Oral presentation	Resource-efficient structures	

Webinar	OTH	23. February 2024	online	Seminar	The methodology of life cycle assessment to quantify the ecological sustainability of materials	
Workshop	OTH	26. February 2024	Regensburg, Germany	High School Activity (MINT week)	MINT workshops with students from 11th grade on Sustainable Building materials	
Network meeting	OTH	27. February 2024	Uelzen, Ger-many	Oral presentation	Presentation on LCA and Circular Economy in the construction sector	

Between 15 and 35 people participated in the workshops. The conference ibausil was attended by more than 300 participants. More than 100 listened to the presentation. During all events, the project Futurebio, it's objectives, and selected project results were presented. For the workshops, hands-on tests were carried out (for example: preparation of thermal insulation materials or mechanical tests on biopolymers or building materials glued incorporating biopolymers).

The feedback was very positive, as the project addressed actual and important issues such as the reduction of plastic pollution and possibilities to tackle climate change.

The network meeting with industry companies and different universities was so successful that a national research project is now being prepared with industry.

h) International workshop: FutureBio has a workshop that will be held by KLU at the end of the project. On the February 5th 2024, an international panel titled "Sustainability and bioplastics in the plastics industry" has been organized at Kırklareli University with the participation of Vice Governor of Kırklareli. The panel was chaired by Prof. Dr. Cem GÖK, Head of Biomedical Engineering Department of Izmir Bakırçay University, and the following scientists and institutions took part as panelists:

Prof. Dr. Alessandro PEGORETTI (University of Trento) "Biopolymers and their importance (an overview)"

Assoc Prof. Dr. Gratiela Dana BOCA (Technical University of Cluj Napoca) "Biopolymer industry in economic perspective"

Prof. Dr. Ülkü SAYIN (Selçuk University) "Biopolymer production and utilization in different sectors"

Assist. Prof. Dr. Lecturer Gülcan İNER (Kırklareli University) "Use of biopolymers in architecture and construction sectors"

Timo Korkalainen (CTRL Reality) "Industrial XR training platform".

Within the scope of June 5 Environment Day activities, a painting and assemblage contest was organized with the participation of 40 schools across the province in cooperation with Kırklareli University and the Kırklareli Provincial Directorate of National Education. At the school, our students were first shown a video containing information about the degradation processes of plastics in nature and biodegradable plastics. Then the painting contest was announced. FUTUREBIO PROJECT PICTURE COMPETITION SPECIFICATIONS have been prepared. The aim of the competition titled "LET'S USE BIODEGRADABLE PLASTICS FOR THE FUTURE" is to raise awareness about Biodegradable Plastics at the primary, secondary, and high school level on issues such as sustainable society, recycling, waste management and plastic use. In this context, it is aimed to reinforce cognitive and affective learning with an art contest after the training to be given in our schools.

Co-funded by the European Union

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FUTUREBİO PROJESİ RESİM YARIŞMASI ŞARTNAMESİ

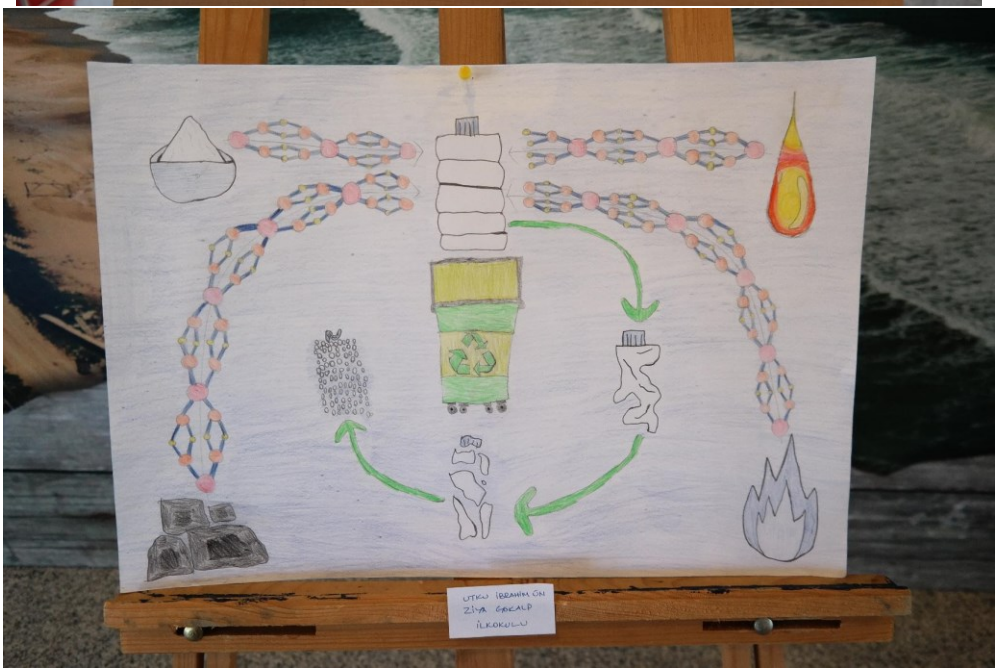
Yarışma Teması

" HAYDİ, GELECEK İÇİN BİYOBOZUNUR PLASTİK KULLANALIM

Yarışmanın Amacı *Biyobozunur Plastikler* konusunda ilk, orta ve lise düzeyinde öğrencilere sürdürülebilir toplum, geri dönüşüm, atık yönetimi, plastik kullanımı gibi konularda farkındalık kazandırmayı amaçlamaktadır. Bu kapsamda okullarımızda verilecek eğitimin ardından bir sanat yarışması ile bilişsel ve duyuşsal öğrenmeyi pekiştirmek amaçlanmaktadır.

Futurebio Projesi "Haydi, gelecek için biyobozunur plastik kullanalım!" (Let's Use Biodegradable Plastic for the Future / FutureBio) Erasmus+ KA220-HED (Yükseköğretim İçin İşbirliği Ortaklıkları) projesi, 2021-1-TR01- KA220-HED-9346B60E numarası ile Türkiye Ulusal Ajansı tarafından desteklenen bir işbirliği projesidir. Biyoplastikler ve biyobozunur


BİYOBOZUNUR DÖNGÜ




Co-funded by the Erasmus+ Programme of the European Union
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RESİM VE ASAMBLAJ
ÖDÜL TÖRENİ
05.06.2023

Many dissemination activities have been carried out by FBK and IND in addition to EDUCA 2023. On 31 March 2023, a secondary school information day was organized and an activity on microplastics visualization was organized. A webinar was organized by ***Dr. Laura Pasquardini***, IND project coordinator.

Secondary school teaching activity	FBK, IND	31 March 2023	Trento, Italy	Scanning Electron Microscope live session	Application of SEM on analysis of microplastics and not only	
Seminar	IND	23 June 2023	online	Seminar	Biomedical application of biodegradable plastics