GOLD

Growing energy crops on contaminated land for biofuels and soil remediation

D4.5

Gold Webinars and Events Interim Report

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Partners

CRES - Centre for Renewable Energy Sources and Saving Foundation, Greece
AUA – Geoponiko Panepistimion Athinon, Greece
TUM - Technische Universität München, Germany
RE-CORD - Consorzio per la Ricerca e la Dimostrazione sulle Energie Rinnovabili, Italy
ETA - ETA Energia, Trasporti, Agricoltura, Italy
Uni-Lublin - Uniwersytet Marii Curie-Sklodowskiej, Poland
TNO - Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijkonderzoek TNO, Netherlands
CERTH - ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS, Greece
UNIBO - Alma Mater Studiorum - Università di Bologna, Italy
INRAE - Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement, France
YNCREA HDF – Junia, France
UNL - Universidade Nova de Lisboa, Portugal
ICL - Imperial College of Science Technology and Medicine, United Kingdom
WR - Stichting Wageningen Research, Netherlands
METE S.A. - METE AE METALLEFTIKI EMPORIKI TEHNIKI AE*MINING TRADING TECHNICAL SA, Greece
IITD - Indian Institute of Technology Delhi, India
HUNAN - Hunan Agricultural University, China
UDES - Université de Sherbrooke, Canada
IBFC - Institute of Bast Fiber Crops, Chinese Academy of Agricultural Sciences, China

Executive Summary

This GOLD deliverable D4.5 is a public report with the description of 'Gold Webinars and Events interim report – A report with the main results of the webinars, events and presentations organized by the Consortium (M24)'. This report is related and linked to Task 4.4 Events, and provides summaries for two events organised by GOLD, Section 1 presents the results of EUBCE 2022 online workshop, and Section 2 presents the results of a webinar about phytoremediation with energy crops for biofuel production. Both events were organised and presented in conjunction with the two sister projects Phy2Cliamte and CERESiS. Both events were considered a success, with a good number of participants and questions asked. Section 3 of this report provides a brief summary of all the third-party events GOLD has participated in during the first two years for the project.

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Introduction

This document presents the main results of webinars, events and presentations organized by the Consortium, during the first two years of the project (M1 – M24). The two main events organised by the consortium were an online workshop at EUCBE 2022, and a webinar about phytoremediation held in March 2023, these will be presented in Sections 1 and 2 respectively of this report. The section 3 of this document will give a brief summary of other webinars, events and presentations, that the consortium has taken part in but not organised.

1 EUBCE 2022 Online Workshop

The European Biomass Conference & Exhibition (EUBCE, www.eubce.com) combines one of the world's leading R&D conferences with an international exhibition, and represents the leading platform for the collection, exchange and dissemination of scientific know-how in the field of biomass.

During the 30th edition of the European Biomass Conference and Exhibition (EUBCE), that was held virtually due to COVID-19 travel restrictions, an online workshop was organized, by ETA for enabling the GOLD project to engage with the international community of bioenergy engineers and researchers, as well as international industry stakeholders.

The event was jointly organised and executed in conjunction with two other similar Horizon 2020 projects, Phy2Climate and CERESiS, that had taken part of the same proposal call.

This section of the report will summarise the preparation process, the content presented, and the conclusions of the EUBCE 2022 online workshop.

1.1 Preparation

The aim of the workshop was to discuss the regulatory and policy framework at the intersection of nature-based contaminated land/soil management and biofuels areas and highlight existing gaps and blind spots, with a view to develop proposals to overcome such gaps. The vision is to facilitate the use of biomass grown in contaminated land for the purpose of phytoremediation to produce clean biofuels for the transport sector.

The current policies and regulatory frameworks for management and clean-up of contaminated sites in Europe do not include biofuel production as a valuable, mutually reinforcing option to remediate sites and generate clean energy. At the same time, all energy and climate policies and their associated projections envisage an increasingly significant role for biofuels for transport up to at least 2030, creating therefore the need for mobilization of significant amounts of (sustainable) biomass feedstock. Considerations related to the land use change effects, as well as the introduction of the low-iLUC risk feedstock concept, have sparked an interest on the exploitation of marginal and contaminated land for biofuels' feedstock production. It is therefore necessary to identify and eliminate the policy and regulatory barriers that may hinder the use of contaminated land for biofuel production.

Workshop organization:
Part 1 of the workshop: introduction and setting the scene; Overview of the significance of biofuels produced from feedstock from remediated contaminated land; overview of policy landscape & challenges.

- Project Presentations (GOLD/Phy2Climate/CERESiS); talk expectations were as follows: to provide an overview, aims & objectives of the three projects.
- Invited speaker: DG JRC: talk expectations were as follows: overview of the policy & regulatory landscape & challenges on management of contaminated land in Europe.

Part 2 of the workshop: panel discussion; How do we visualise (main elements) the policy framework for the value chains proposed by the 3 projects to be exploitable? What are the challenges and needs at national and EU level to be considered?

- Panel consisting of:
- Additional relevant EC speakers;
- Experts from the Consortiums (1 per consortium).

The objective of Part 2 of the workshop, was to include discussion around the preliminary findings of the policy analysis performed by the 3 projects, which has broadly shown that there is a marking lacking between the land management and the sustainable biofuels, and therefore a specified policy framework should be developed for bridging the gap between phytoremediation strategies and clean biofuel production and thus fully exploiting the concepts proposed by the projects.

Three external speakers were specifically selected and invited to be part of the joint event based on their experience and relevant input associated with each project, these included:

- Maria Georgiadou, EC DG RTD, Senior Expert, to give an overview of the bio-energy aspect related to these projects and relevant in the EU;
- Luca Montanarella, EC JRC, Senior Expert, to give an insight and overview of the current work on the EU's Soil Strategy and Soil Observatory;
- Mirco Barbero, EC DG ENV, Policy Officer, to form part of the panel discussion specifically to share his opinion on soil protection, sustainable land use and connecting these aspects to energy production.

The event was shared and publicised to stakeholders through the EUBCE website, direct email invitation and social media posts (see the following figure).

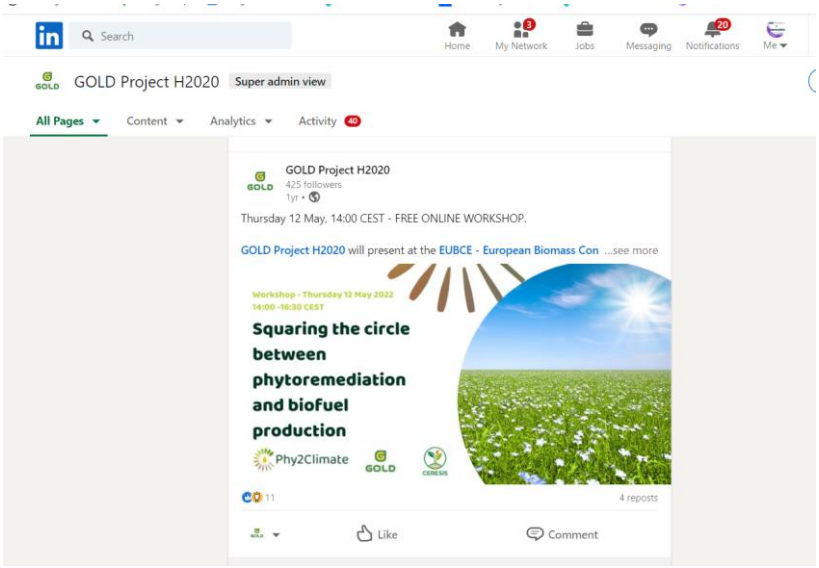

Figure 1: Example of social media promotion.

1.2 Workshop Summary

On Thursday 12th May 2022, at EUBCE 2022, three similar Horizon 2020 projects: Phy2Climate, GOLD and CERESiS, held a two hour workshop in which the three projects were presented, as well as hearing from European Commission experts on the subjects of renewable energy, soil protection and policy.

The workshop commenced with opening remarks from Maria Georgiadou, Senior Expert, European Commission, DG Research and Innovation, in which she summarised the EUs Green Deal manifesto and the EUs climate and energy policies. The renewable energy commitments for the 'Fit for 55' package and REPowerEU were also presented, concluding with a summary on the Horizon Europe programme.

After the opening remarks the three projects were presented, the aim of which is to remediate contaminated sites through the growth of specific contaminate absorbing crops, and then to use such crops as a feedstock to create biofuels. Each of the three projects is using its own method of conversion and different types of crops, all of which was summarised in this workshop (see figures 2).

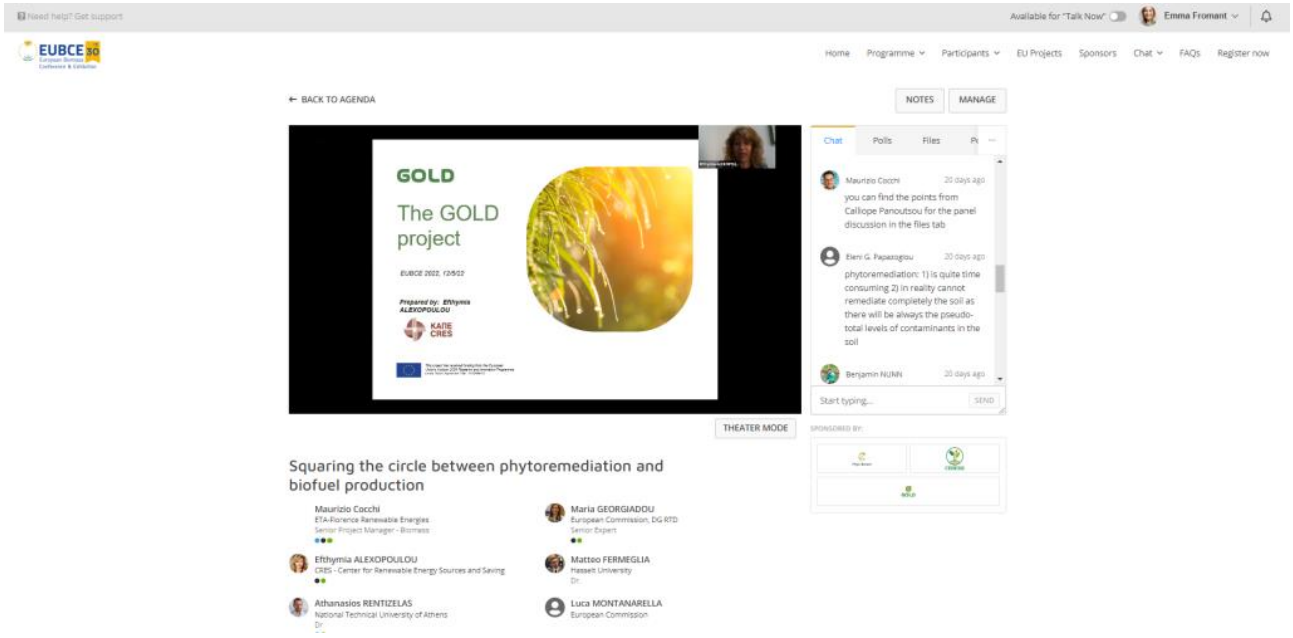

Figure 2 Efthymia Alexopoulou, CRES, introduces GOLD project.

To finish the first session of the workshop, Luca Montanarella, EC Joint Research Centre, Land Resources Unit, presented a summary of the EU's Soil Strategy and Soil Observatory. In this informative presentation we hear about the background and history of the EUs legislation and policy regarding soil quality, the importance of soils in the fit against climate change, and the vision the EU has for monitoring and protection. The main goal of the EU soil observatory is to monitor and accurately map contaminated sites throughout Europe, whilst engaging in scientific and citizen working groups.

Figure 3 Luca Montanarella, EC Joint Research Centre, Land Resources Unit, presenting the EU's Soil Strategy and Soil Observatory

To conclude, the workshop rounded off with a 45 minute panel discussion, moderated by Matteo Fermeglia, including the following panellists:

- Mirco Barbero, EC DG ENV, Policy Officer – Soil protection and sustainable land use;
- Luca Montanarella, EC JRC, Senior Expert – Sustainable Resources;
- Marko Perisic, Hasselt University, Belgium (see figure 5);
- Efthymia Alexopoulou, CRES, Greece;
- George Vourliotakis, Exergia, Greece.

To start the panel discussion with we heard from the three project representatives, of which the discussion revolved mostly around the gaps in policy that would help to bridge the gap between phytoremediation techniques and the production of biofuels. Marko mentioned policy gaps have been identified in different aspects of the project, including those for invasive species, waste management and agricultural, to name a few. Whilst George and Efi touched upon the need for better mapping of contaminated sites and looking toward investment and premiums for this type of value chain.

We also heard from Luca, who gave an overview of the EU's work on soil health, and highlighted the biggest challenge as the lack of clear definitions in regards to contaminated and degradation land. He also expresses a positive opinion towards the research outcomes of these projects, but highlighted his concern that if contamination is just displaced, this type of remediation and fuel production will not be a valid solution.

Mirco echoed Luca's comments linked to clear definitions, and also expressed challenges of setting new soil laws. One of which is the need to apply laws that are accepted and implementable by all member states, in some cases this could ensue enormous costs associated with the remediation of contaminated land. Therefore, Mirco views cost cutting a positive aspect, but also that all options will be risk assessed for cost and benefits before being considered as applicable.

1.3 Workshop conclusions

The workshop was considered a success with over 50 online participants joining to watch or take part in the discussion, and a further 51 views of the recording have been registered on the projects YouTube channel. Through this workshop the project was able to engage and disseminate information internationally to the bioenergy and biomass global community, as well as convey key policy recommendations to and with European Commission representatives that took part either as a speaker in the workshop or online in the audience. This workshop was filmed and is available to watch again here: https://youtu.be/kSoHOPo3_eA.

2 Webinar: Phytoremediation with energy crops for biofuel production

On the 15th March 2023 three H2020 projects: GOLD, Phy2Climate, and CERESiS presented in a two hour webinar focusing on the phytoremediation aspect of the research. The webinar was organised and hosted by ETA on behalf of GOLD, and in conjunction with Phy2Climate and CERESiS, all of which have at least one year's worth of phytoremediation results from their respective projects.

This section of the report will summarise the preparation process, the content presented, and the conclusions of the 2 Webinar: Phytoremediation with energy crops for biofuel production.

2.1 Preparation

The aim of the webinar was to share and discuss the phytoremediation results of these three similar projects with a varied and global online audience.

All three projects took part in the same call to achieve 'Combined clean biofuel production and phytoremediation solutions from contaminated lands worldwide'. Dedicated biofuel production at large scale depends on sustainable land availability that does not compete with other uses. Phytoremediation is a holistic approach that has the potential to manage land contaminated with a wide range of pollutants. Therefore, the challenge faced by all three projects is to bridge the gap between phytoremediation strategies and clean biofuel production in a sustainable and optimum manner that will overcome the indirect land use change (iLUC) issue for biofuels and restore lands for agricultural uses.

The first step in bridging the gap is by determining the best energy crops to grow on contaminated soil, that will not only facilitate the remediation of the soils but will also provide the highest yield of feedstock for producing liquid biofuels. All three projects have now completed at least one year of field trials, on low iLUC lands, all around the world, and this webinar allowed the three projects to talk about how successful the phytoremediation part of the research had been so far.

Webinar organisation:

The webinar was organised in conjunction with all three projects, efficiently organised within two online meetings, the first with the GOLD project partners concerned with WP1 to talk about what could be presented, and then after some email exchanges, a second online meeting was organised with the phytoremediation WP leaders from all three projects. In the second meeting the agender and speakers were determined as follows:

- GOLD: Eleni G. Papazoglou, Agricultural University of Athens
  - 7 trial sites – Greece, France, Poland, China, Italy
- Phy2Climate: Alfreda Kasiuliene, Biovala
  - 4 trial sites – Spain, Serbia, Lithuania, Argentina
- CERESiS: Richard Lord, University of Strathclyde
  - 8 trial sites – Brazil, UK, Ukraine, Italy
- Round table discussion with all relevant phytoremediation project partners, chaired by Markus Puschenreiter, Institute for Soil Research, University of Vienna, Austria (Phy2Climate project partner).

The event was shared and publicised to stakeholders through the project websites, direct email invitation and social media posts. The email invitation reached 8717 subscribers to ETA's mailing list, whilst the social media posts would have reached close to 4000 subscribers through ETA's and the project direct networks.

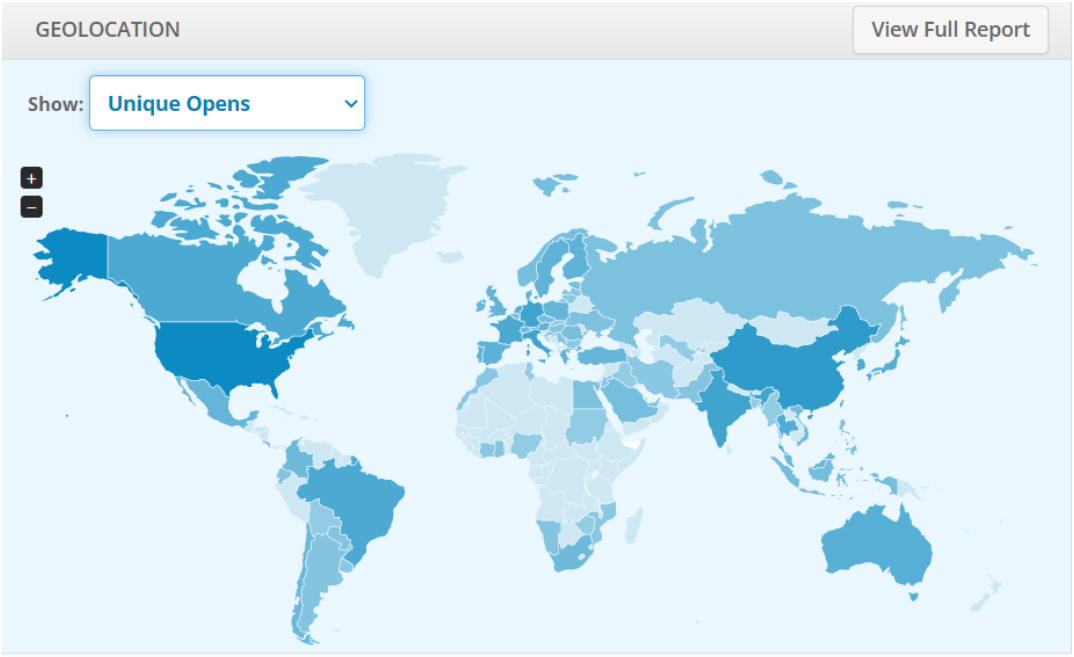

Figure 4 *Geolocation map showing globally where the invitation was opened*

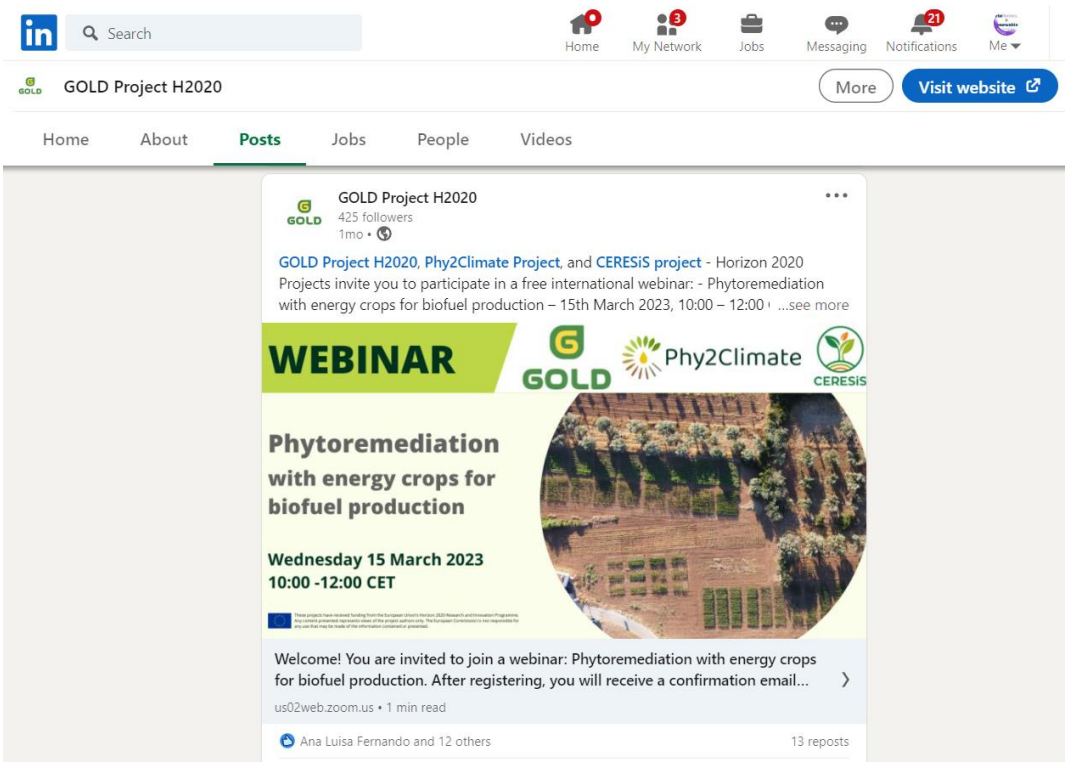

Figure 5 *Example of a social media post advertising the webinar*

2.2 Webinar summary

The webinar was opened by Emma Fromant, ETA-Florence, who introduced the three projects and how they are connected. The three projects all took part in the same proposal call (BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: SECURE, CLEAN AND EFFICIENT ENERGY (H2020-LC-SC3-2018-2019-2020), to fund research projects under the title of 'Combined clean biofuel production and phytoremediation solutions from contaminated lands worldwide'. The introduction included a summary of how all three projects have similar objectives but are following different methodologies to achieve them, and wrapped up by leading into the webinar with a few words about the first step in bridging the gap is by determining the best energy crops to grow on contaminated soil, that will not only facilitate the remediation of the soils but will also provide the highest yield of feedstock for producing liquid biofuels.

All three projects have now completed at least one year of field trials, on low iLUC lands, all around the world, and in this webinar we heard from all three projects about the phytoremediation part of the research.

GOLD was the first project presented, by Dr. Eleni G. Papazoglou, Agricultural University of Athens. In this presentation Papazoglou presented an overview of WP1; the 7 selected sites (5 in Europe: France, Greece, Poland, Italy, and 2 in China), the selected energy crops based on the greenhouse pot trials, and the results from the field trials. All the cites in the GOLD project used the same trial crops – Sorgum, Hemp, and Miscanthus. Papazoglou rounded off this presentation with a conclusion of the best performing crops per project partner, in regards to the it's biomass yield.

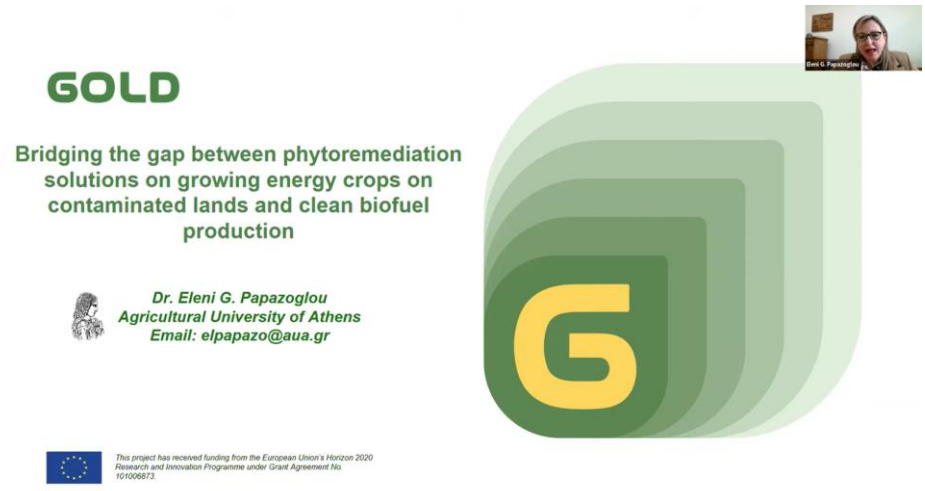

Figure 6 *Eleni G. Papazoglou presenting GOLD during the webinar*

Following on, Alfreda Kasiuliene, Biovala, presented Phy2Climate project's implementation of phytoremediation pilots, the concept and design of WP2, and how it links to the other work packages in the project. Kaisuliene then went on to present a summary of the test site characteristics, the selected trial crops, and results. Phy2Climate conducted trials on four sites, in Spain, Serbia, Lithuania, Argentina, one in each country, each of the sites trialled different crops depending on the pot test results. The Spanish site trialled Shorghum sp. and Brassica napus, and used soil amendments of Compost, PGPR, Biochar. The results of this site showed a decrease in TPH and PAH concentrations in the soil, and the sorghum plus amendments produced the highest biomass yield. The Lithuanian site trialled an herbaceous plant mis, amaranth, and Jerusalem artichoke, with soil additives of bacteria, fertilizer, and compost. The results at this site concluded that Herbaceous plants demonstrated the best performance in regards to biomass output and

phytoremediation potential. The Serbian site selected a single crop trial using rapeseed, with results showing a good biomass yield and ability to absorb Cd from the soil. The Argentinian site selected five different trial crops, one of these being quinoa. As yet results are unavailable due to the differences in growing season.

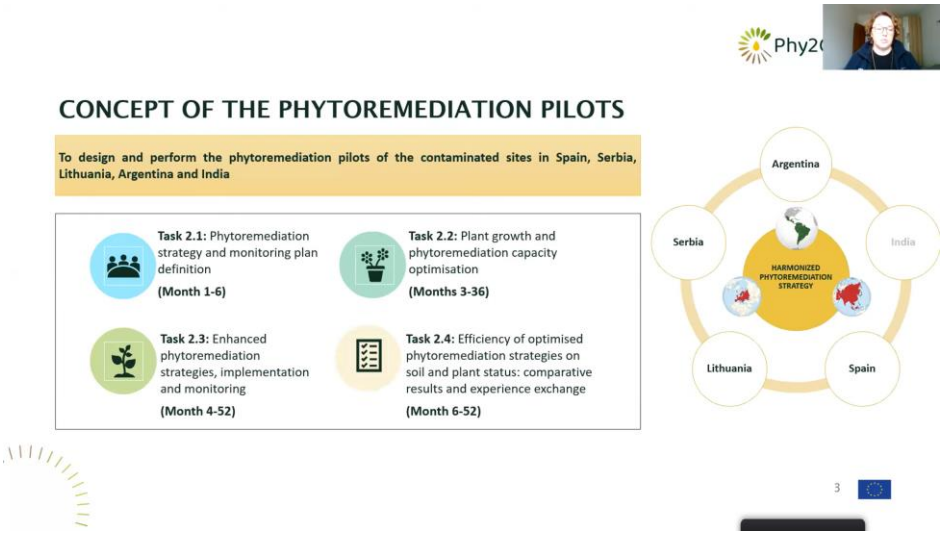

Figure 7 *Alfreda Kasiuliene presenting Phy2Climate during the webinar*

CERESiS was the third project to be presented by Richard Lord, University of Strathclyde. This project has eight trial sites in four countries: UK, Brazil, Italy, and Ukraine. All four sites selected different energy crops. The sites in Brazil trialled Capiacu and Napier grass, and sugar and energy canes. The Ukrainian sites trialled reed canary grass, and miscanthus. The Italian sites trialled giant reed, and switchgrass, as well as hazel and vine prunings. The UK sites trialled Reed canary grass, Phalaris, and miscanthus. The results largely concluded that most of the energy crops grew well enough on the contaminated land, however the uptake of contamination and thus phyto-remediation was low.

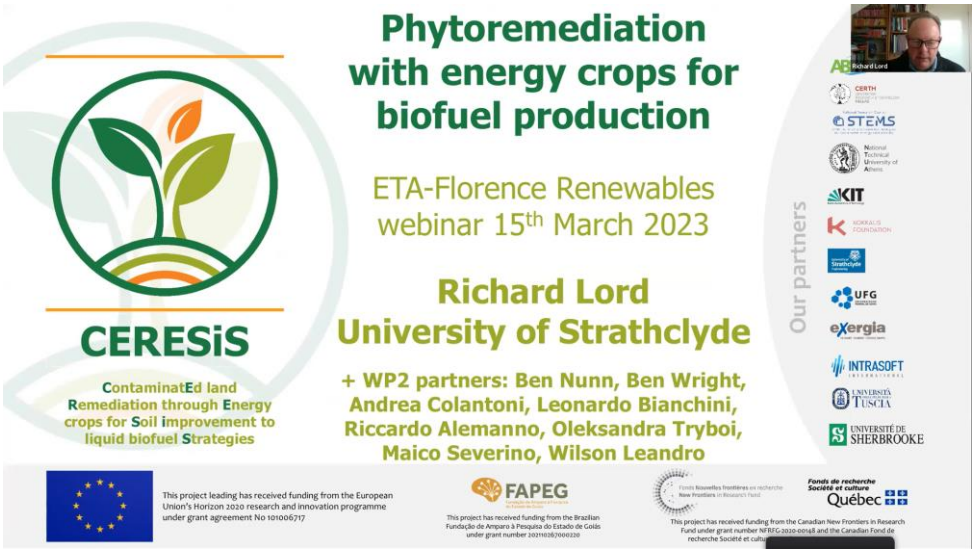

Figure 8 *Richard Lord presenting CERESiS during the webinar*

The webinar concluded with a 40-minute panel discussion led and chaired by Markus Puschenreiter, Institute for Soil Research, University of Vienna, Austria. Various questions were asked and discussed during the session, a summary of the main theme is provided herein.

The first area of discussion focused on how the different sites managed irrigation and another important aspect such as soil management or site management strategies, with fertilization or stabilization of contaminants, and/or pest management. The conversation then moved on to sharing experiences on how to treat the biomass after harvesting, and how the biomass was managed and treating before transportation to the appropriate project partners for analysis and conversion. The challenge of drying such a large amount of biomass was then spoken about, and how material can be lost during this process. A short section was dedicated to the fate of the pollutants and how this part requires more research. The conversation then moved on the soil quality aspect and if these projects have seen any improvements in the first year or so, and then linking that to the question around economic incentives for using contaminated land. Finally this session wrapped up with a quick mention about the delicate social issue surrounding contaminated land, as often these lands are already used in communities unaware of the risks of contamination.

2.3 Conclusions

The webinar was considered a success with a total of 121 unique viewers, and 101 concurrent views, during the webinar. The webinar was a valuable tool to efficiently disseminate the results from these projects internationally, as well as hold a space for partners and stakeholders to discuss research outcomes and ideas, all within the two-hour webinar. Webinars are essential and key to enable global collaborations and exchange of information without the need for extensive travels, costs, and organisation. This webinar was filmed and is available to watch again here: https://youtu.be/XUxklfhfPoU.

3 Other events

During the first two years of the project GOLD has taken part in several events and conferences, online and in person, to disseminate the research goals and it's intended outcomes. Herein is a list to summarise:

1. EXPO 2020 Dubai - Project Coordinator Efthymia Alexopoulou presented GOLD – Bridging the gap between phytoremediation solutions on growing energy crops on contaminated lands and clean biofuel production on October 4th 2021 at Expo 2020 in Dubai.
2. Squaring the circle between phytoremediation and biofuel production. On Thursday 12th May 2022, at EUBCE 2022, three similar Horizon 2020 projects: GOLD, Phy2Climate and CERSiS, held a two hour workshop.
3. Bridging the gap between phytoremediation solutions on growing energy crops on contaminated lands and clean biofuel production, was presented at the 8th European Bioremediation Conference, in Chania, Greece, June 12 to 17, 2022, by Papazoglou, E.G., Wójcik, M., Vangronsveld, J., Oustriere, N., Mench, M., Zegada, W., Alexopoulou, E. 2022.
4. AGROTICA 2022, in Thessaloniki, 20 to 23th of October 2022. Where CRES had a stand with posters and leaflets with all projects running by CRES, as well as a workshop where D. Kotoula, E.G Papazoglou (2022) presented "Cultivation of fibre crops in polluted soils and utilization of the produced biomass".
5. Presentation of Optimization of phytomanagement strategies on soils contaminated with metals (Cd, Pb, Zn) to provide biomass for clean biofuel production - Lessons from a pot trial, by Felix Ofori-Agyemang, Christophe Waterlot, Michel Mench, Nadège Oustriere, at the 21st International Conference - Exhibition of Soils, Sediments and Water (INTERSOL), Lyon. 21st June 2022.

6. Canadian Chemical Engineering Conference 2022 - 23-26 October. "Fischer–Tropsch Synthesis over a bimetallic catalyst cobalt-iron supported on hydroxyapatite in a GLS slurry reactor configuration". Oral presentation by Sabrina Karakache, Université de Sherbrooke.
7. The 51st national conference of the Italian Society of Agronomy (SIA), in Padua on 19-21 September 2022. "Potential Of Biostimulants To Increase Sorghum Bicolor Biomass Production And Phytoremediation Efficiency" presented by Pietro Peroni, Walter Zegada-Lizarazu, Rossella Mastroberardino, Andrea Monti.
8. „Konopie przemysłowe (Cannabis sativa L.) – roślina o dużym potencjale użytkowym" (Industrial hemp (Cannabis sativa L.) – a plant with high exploitation potential), III Ogólnopolska Konferencja Naukowa "Perspektywy wykorzystania roślin w nauce i przemyśle", 18.11.2021 – oral presentation (in Polish)
9. „Wpływ biostymulantów na wzrost roślin i ich odporność na czynniki stresowe" (Effect of biostimulants on plant growth and resistance to stress factors), Ogólnopolska Konferencja Młodych Naukowców nt. „Nowe wyzwania dla polskiej nauki", CREATIVETIME, Kraków, 4.11.2021 – oral presentation (in Polish)
10. „Wykorzystanie roślin energetycznych do rekultywacji terenów skażonych metalami ciężkimi" (Use of energy crops for the remediation of areas contaminated by heavy metals), Ogólnopolska Konferencja Młodych Naukowców nt. „Nowe wyzwania dla polskiej nauki", CREATIVETIME, Kraków, 4.11.2021 – oral presentation (in Polish)
11. „Effect of biostimulants on growth and metal accumulation of Miscanthus x giganteus", 1st PhD Student's Conference at the University of Life Sciences in Lublin, Poland: „Environment-Plant-Animal-Product", 26.04.2022 – poster presentation (in English)
12. „Wpływ biostymulantów na wzrost i akumulację metali w Miscanthus x giganteus" (Effect of biostimulants on growth and metal accumulation of Miscanthus x giganteus), 59 Congress of the Polish Botanical Society, Warsaw, 27.06-01.07.2022 – poster presentation (in Polish)
13. "Budowanie mostu między fitoremediacją opartą na uprawie roślin energetycznych na zanieczyszczonych terenach, a produkcją czystego biopaliwa (projekt GOLD) – badania wstępne nad wpływem biostymulantów na wzrost roślin i akumulację metali" (Bridging the gap between phytoremediation solutions on growing energy crops on contaminated lands and clean biofuel production (the GOLD project) – preliminary studies on the effects of biostimulants on plant growth and metal accumulation), 59 Congress of the Polish Botanical Society, Warsaw, 27.06-01.07.2022 – oral presentation (in Polish)
14. Sebastian Fendt; Leuter, Philipp; Dossow, Marcel; Spliethoff, Hartmut (2022): 3rd Generation Biorefinery - Production of basic chemicals by utilization of biogenic residues via entrained flow gasification with coupled gas fermentation. Key Technologies in the Bioeconomy A Global Bioeconomy Alliance Conference September 27th to September 29th, 2022 Straubing, Germany
15. Marcel Dossow, Philipp Leuter, Hartmut Spliethoff, Sebastian Fendt (2022): Decontamination of polluted soils: a gas fermentation model for SynFuel production and techno-economic estimation. DECHEMA - (Bio)Process Engineering - a Key to Sustainable Development. ProcessNet (Bio)Process Engineering – a Key to Sustainable Development, Aachen (14.09.22), Germany
16. BIKE-Biofuel project WORKSHOP: Production of low ILUC Risk biomass feedstock - gathering views and results from a series of ongoing and recent Horizon 2020 and Horizon Europe projects, Thessaloniki, Greece, 30.03.2023.

4 Report Conclusion

This deliverable D4.5 – GOLD webinar and events interim report, concisely presents the two online events hosted by GOLD in the first half of the project. The two events included an online workshop at the EUBCE 2022, and a webinar: Phytoremediation with energy crops for biofuel production, both of which were organised and presented in conjunction with the two sister projects Phy2Cliamte and CERESiS. Both events were considered a success, with a good number of participants and questions asked.