T3.1 Organisation of an Industry Resource Group

Work package n°3 - Training of HEI students, on how to reduce the water footprint in the textiles sector

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Project acronym:	REWAFT
Project full title:	**Helping the textile industry reduce its water footprint**
Grant agreement no.:	**n° 2022-1-LT01-KA220-HED-000086367**
Responsible partner for deliverable:	**University of West Attica (UNIWA)**
Contributing partners:	**UNIVERSITY OF WEST ATTICA (UNIWA)** **KAUNO TECHNOLOGIJOS UNIVERSITETAS (KTU)** **UNIVERSITAT POLITECNICA DE VALENCIA (UPV)**
Author(s):	**Kyriaki Kiskira (UNIWA)**
Distribution level:	**Public**
Total number of pages:	
Version:	
Language	**English**
Reviewed by:	**KTU, UPV**
Status:	
Delivery date:	

Version control

Number	Date	Description
V0.1	11/06/2023	Initial draft by UNIWA
V0.2	12/06/2023	Reviewed by KTU and LATIA
V0.3	12/06/2023	Reviewed by UPV
V1.0	13/06/2023	Final

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Contents

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Executive Summary

This report titled “Organisation of an Industry Resource Group” provides a comprehensive information about the formation of groups with industry experts that consist of at least 3 persons per country (Greece, Spain, Lithuania) and the organisation of the two meetings for each group.

It is the Task 3.1 of Work package n°3 - Training of HEI students, on how to reduce the water footprint in the textiles sector. The main objective of this WP is to raise awareness and train HEI students on the importance of using sustainable means for water use in the textiles industry. HEI students are going to learn about the water footprint, the importance of calculating it and also how to measure and reduce it.

Partners formed groups with industry experts and organised discussion with them, in order to identify the most important topics which affect a textile company's water footprint, which will be included in a series of seminars for HEI students. The Industry Resource Group of each country will be involved in the co-design and delivery of seminars for students (T.3.2. Co-design of a series of seminars).

It is evident from this report that the experts of all countries highlighted some important issues that should be included in the series of seminars, such as advanced finishing technologies and new machinery that help to reduce the water and energy consumption and water footprint in textiles, the most water consuming and polluting technological processes in the textile industry and treatment of polluted water in the textile industry, waste management in textile companies that use water in their production process , sustainable dyes, pigments and chemical for textiles finishing, use of sustainable alternative treatments at different stages of the process to reduce water consumption, water footprint calculation methodologies and tools, published/upcoming European directives, regulations and legislations in terms of sustainability and water footprint reduction in the textile industry and finally, action plans for water footprint reduction. Furthermore, it was found that experts have many questions and doubts regarding the water footprint calculation methodologies and tools that can be used in the industry for the reduction of the water footprint.

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1. Introduction

The world confronts major climatic concerns as the 2020s begin. Water, being a globally scarce resource with increasing demand, has a significant impact on global ecosystems, generating a serious environmental imbalance in aquatic ecosystems and placing many species in risk. According to a World Bank analysis from 2019, "some studies have shown that the textile industry is responsible for approximately one-fifth of global water pollution." Although the CO2 footprint is well-known, few people have heard of the Water Footprint. The idea of water footprint (WF) represents a significant advancement in the growth of methodologies, approaches, and indicators for monitoring freshwater appropriation and analysing wastewater outflow.

In response to the foregoing, the REWAFT project seeks to promote awareness of the water footprint in the textiles sector, as well as the sustainability skills of students and textile enterprises in the use of water in textiles. The project will specifically create a model and an online tool to assist textile companies in measuring their water footprint and developing action plans to reduce it. Furthermore, the project will create an e-learning course for businesses, organise study visits, collect best practices, and create a series of seminar courses for HEI students and graduates in textile engineering to help them develop their sustainability skills in reducing the textiles sector's water footprint. These practices will prepare HEI students, graduates, and staff to be true change agents, resulting in a considerable reduction in textile water footprint.

Furthermore, through developing learning and teaching collaborations between HEIs and the business sector, the project will build an entrepreneurial, open, and innovative higher education sector. Seminar courses for HEI students and graduates will be co-designed with industry professionals, who will also be involved in seminar delivery. Furthermore, the project intends to create learning outcomes and student-centered curricula that better suit students' learning requirements and eliminate skill mismatches while also being relevant for the job market and society as a whole. The project's outcomes will promote the lifelong learning dimension of higher education and mainstream sustainable development by providing learning opportunities for students, graduates, and staff (seminars, e-learning, study visits, good practices) aimed at addressing wastewater use in the textiles sector.

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The current report contains the results of the Task 3.1: Organisation of an Industry Resource Group of the Work package n°3 - Training of HEI students, on how to reduce the water footprint in the textiles sector. The main aim of the WP3 is to develop a seminars course for HEI students, which will help them gain the necessary skills in order to be able to identify, measure and reduce the water footprint in textiles.

1.1 Aims

This report aims to provide the information of the development of 3 industry resource groups per country (Greece, Spain, Lithuania) which will involve at least 3 industry experts each, that will facilitate collaboration between HEIs and textiles companies for the design of a series of 5 seminars for HEI students and development of learning materials.

1.2 Methodological aspects

Leader of the activity 3.1 “Organisation of an Industry Resource Group” is University of West Attica (UNIWA) in Greece. The University partners that are UNIWA, Valencia Polytechnic University (UPV) and Kaunas University of Technology (KTU), formed groups of industry experts on the water footprint and textiles sector. The industry resource groups will ensure the smooth collaboration between HEIs and the business world. KTU in Lithuania worked with Lithuanian apparel and textile industry association (LATIA) and UNIWA with IDEC for the identification and recruitment of experts for the industry resource groups. For the recruitment of experts UPV organized 3 physical meetings, while UNIWA and IDEC, and KTU with LATIA organized 2 online meeting for each group. The topics of seminars were discussed and questions and doubts were raised. Furthermore, in relation to WP4, as the Leader is UPV, the Spanish Research Group discussed during these meetings the creation of MOOCs.

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2. Minutes of the meetings in Lithuania

Two meetings with Lithuanian industry experts were organized online on 31st of March and 13th of April 2023 by Kaunas University of Technology (KTU) and Lithuanian Apparel and Textile Industry Association (LATIA). The aim of these meetings was to develop an industry resource group, in order to facilitate collaboration between the university and textiles companies and to involve the industrial experts into the design of series of seminars for students and development of the learning materials.

Both meetings were attended by:

- **Daiva Mikučionienė, Rimvydas Milašius, Ginta Laureckienė** from Kaunas University of Technology (KTU), Lithuania.
- **Asta Tumaitytė** from Lithuanian apparel and textile industry association (LATIA), Lithuania.
- **Vydas Damalakas** from UAB Omniteksas, Lithuania.
- **Virginijus Vizbaras** from UAB A Grupė, Lithuania.
- **Jurgita Stankuniene** from AB Utenos trikotažas, Lithuania.

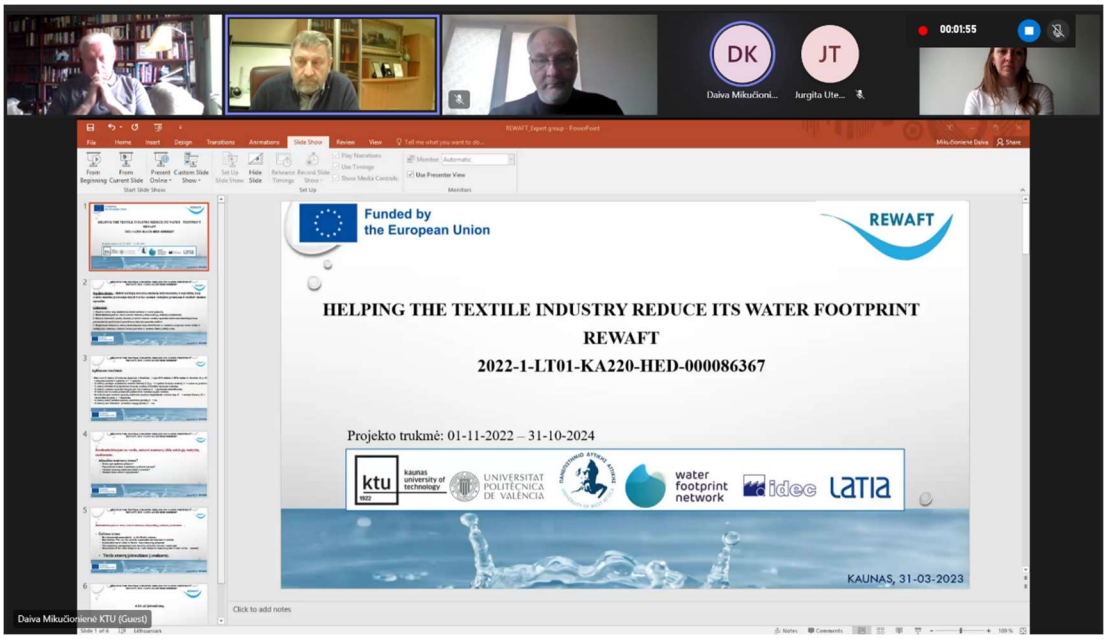

Figure 1: First online meeting with Lithuanian industry experts that was organized online on 31st of March by KTU and LATIA

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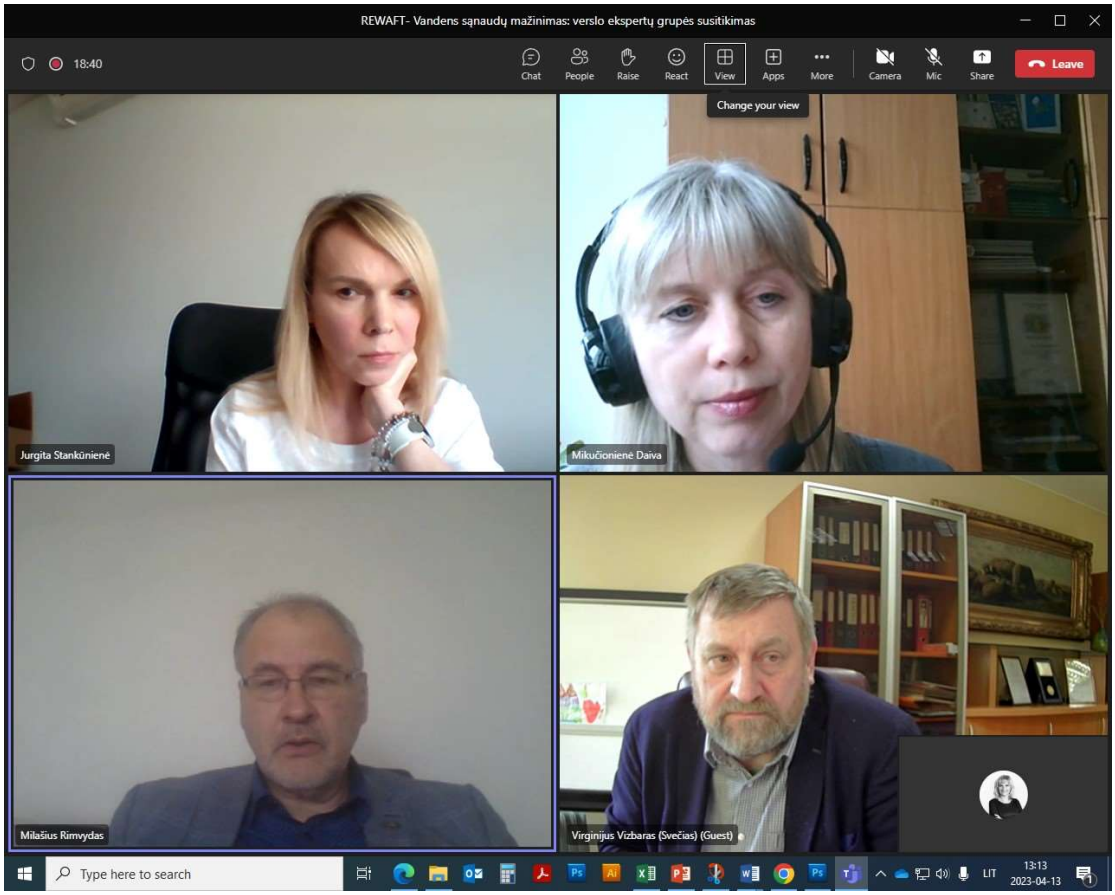

Figure 2: Second online meeting with Lithuanian industry experts that was organized online on 13th of April by KTU and LATIA

Summary of the meetings and conclusion reached:

During the meetings, discussions were organized between the representatives of KTU, LATIA and three industrial companies ("Omniteksas", "Utenos trikotažas" and "AGrupė") to identify the most important topics for the industrial companies about the water footprint, which will be included in the series of seminars for HEI students. The Industry Resource Group of Lithuania will be involved in the co-design and delivery of seminars for students.

In the first meeting, the REWAFT project coordinator, Daiva Mikučionienė (KTU) presented the aim and tasks of the project, the main activities, and the role of the industry in the project. Then each of the industrial experts gave a summary of their company's activity. The main attention was taken to the WP3 – "Training of HEI students, on how to reduce the water footprint in the textiles sector". Case studies of the companies implemented to reduce the water footprint and to manage and calculate water consumption in different technological processes were presented by the companies. Other topics discussed during the meetings

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were: action plans for how to reduce the Water Footprint; technological processes in the textile industry in which consumption of water is the highest; most polluting technological processes and the treatment of polluted water in the textile industry; possibilities to reuse the water in the same or in other stages of the manufacturing; concept and methodologies used for calculating the water footprint; advanced finishing technologies and devices that helps to reduce the water and energy consumption; new European directives and regulations in terms of sustainability and water footprint reduction in the textile industry.

The industrial experts highlighted these topics which have to be included into curricula of the seminars and in the MOOC as well:

- Advanced finishing technologies and machinery that help to reduce the water and energy consumption and water footprint in textiles;
- The most water consuming and polluting technological processes in the textile industry;
- Sustainable dyes, pigments and chemical for textiles finishing;
- Water Footprint calculation methodologies and tools;
- Published and upcoming European directives, regulations and legislations in terms of sustainability and water footprint reduction in the textile industry.

The questions raised from the industrial experts are:

- How many initial data will the newly developed “Tool for the measurement of the water footprint in the textiles sector” require;
- Whether the Tool is going to be general for the textile industry or focused on a specific technological process.

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3. Minutes of the meetings in Spain

The three meetings took place on 6, 11 and 12 April 2023 in Alcoy, Spain, at the Department of Textile and Paper Engineering, Edificio Ferrandiz F4-D10 of the Alcoy Campus of the Universitat Politècnica de València.

6 April: AITEX

Attended by:

- **Pablo Díaz García** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Mª Ángeles Bonet Aracil** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA, (UPV) Spain.
- **Raquel Belda Anaya** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Ignacio Montava Seguí** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Eva Bou Belda** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Jaime Gisbert Payá** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Jorge Domenech Pastor** – Project Manager of AITEX

11 April: AQUACLEAN GROUP

Attended by:

- **Pablo Díaz García** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Raquel Belda Anaya** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Ignacio Montava Seguí** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Germán Bataller Olcina** – Sustainability Manager. AQUACLEAN GROUP.

12 April: CARE APPLICATION

Attended by:

- **Pablo Díaz García** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Mª Ángeles Bonet Aracil** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA, (UPV) Spain.
- **Ignacio Montava Seguí** from UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV), Spain.
- **Carmina Ferri Valero** – CEO & Funded of CARE APPLICATION

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Figure 3: Third online meeting with Spanish industry experts that was organized on 12 April 2023 in Alcoy, Spain, at the Department of Textile and Paper Engineering of the Alcoy Campus of the Universitat Politècnica de València.

Summary of the meetings and conclusions reached

The Rewaft Project and the different packages and activities were presented.

Each of the experts gave a summary of their company's activity.

WP3 was commented on concerning the topics of the student seminars. These are some of the issues that have been raised with experts:

- Difficulties in the implementation of Water Footprint reduction systems in the Textile Industry
- Case study: Experience of a Company that has implemented its Water Footprint calculation system
- Action Plans for Water Footprint Reduction Treatment of polluted water in the textile industry
- Waste management in textile companies that use water in their production process.
- Use of sustainable alternative treatments at different stages of the process to reduce water consumption.
- New available machines and technology to reduce water consumption.
- Concept and methodology for calculating the water footprint
- The current situation of the textile industry and the legal requirements in terms of sustainability and water footprint reduction expected in the coming years.

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It has been agreed with them the possibility of giving a seminar on the topics presented to the students. Confirmation is pending and they will inform on which topic.

In relation to WP4, they have been asked about a course on water footprint for workers in the textile industry. The proposed contents were presented to them and they found them very interesting.

- Sustainability concept
- Water footprint concept
- Water-related Sustainable Development Goals (SDGs)
- Types of water footprint
- European water footprint regulations and standards and application in the textile sector
- Current status of the Water Footprint in the textile sector
- Water footprint in textile products
- Water Footprint in the textile process
- Importance of measuring the Water Footprint of a product or process
- Methodology for calculating the Water Footprint
- Water Footprint calculation tool
- Use of low water-use technologies
- Use of more sustainable dyes
- Use of more sustainable chemicals
- Improved water management
- Sustainability certifications

Other proposals were made:

- Policies and strategies for sustainable water management in the textile sector: What policies and strategies are being implemented by governments and organisations to reduce the water footprint in the textile sector? How can companies collaborate with these actors to improve sustainable water management?

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- Case studies of companies that have implemented measures to reduce their water footprint in the textile sector. How have they managed to reduce their water consumption and improve their environmental performance? What are the lessons learned from these cases?

Some of the doubts raised were:

- At what level the MOOC will be developed. Because depending on the target audience, some topics are more interesting than others.
- Whether it is going to be general for the textile industry or focused on a specific process.
- The time taken to do the MOOC

With regard to the implementation of the water footprint in the textile industry, the following challenges or difficulties that have arisen should be highlighted:

- Complexity of the supply chain: making it difficult to measure water consumption at each stage of the supply chain.
- Unavailability of correct data on water consumption in their supply chain.
- Economic investment: adoption of sustainable technologies and practices.
- Lack of detailed and specific legislation or regulations on implementation. ISO standard is voluntary.

It was agreed to keep in contact and to keep informed about the progress of the project in order to collaborate between the companies and the university in the project.

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4. Minutes of the meetings in Greece

Two meetings with Greek industry experts were organized online via MS Teams on **7th of April and 12th of April 2023** by University of West Attica (UNIWA) and IDEC.

The aim of these meetings was to develop an industry resource group, in order to facilitate collaboration between the university and textiles companies and to involve the industrial experts into the design of series of seminars for students and development of the learning materials.

Both meetings were attended by:

REWAFT members

- **Georgios Priniotakis, Ioannis Chronis, Kyriaki Kiskira** from University of West Attica (UNIWA), Athens, Greece and **Nefeli Dimopoulou** from IDEC.

Industry Resource Group

- **Haris Bakoloukas**, Managing Director AXIA CERT LTD, Certification Body, Private, Metallurgical Engineer, MSc
- **Antonis Ntafos**, Production Manager (Dyehouse), BETTINA SA Company, Private, Knitting/Finishing/Clothing manufacturing, Textile Engineer
- **Athina Ketsitzi**, Textile engineer/weaver, Tsiakiris silkhouse, Silk production, Private, Textile engineering
- **Nikolaos Zacharopoulos**, Post-Doc Researcher, Department of Chemistry, National and Kapodistrian University of Athens (NKUA), Public, Field: Inorganic and Organometallic Synthetic Chemistry, Catalysis, Sustainable Textiles, Chemist, M.Sc. in Inorganic Chemistry and Technology, PhD in synthetic organometallic chemistry and catalytic appliations in hydrogenation reactions
- **Sofia Plakantonaki**, Researcher National Technical University of Athens (NTUA), School of Chemical Engineering, Environmental Studies, Chemical Engineering, Chemical Engineering, MSc Environment and Health, Sustainable textiles
- **Konstantinos Kalkanis**, Professor, Department of Electrical and Electronics Engineering, University of West Attica (UNIWA)

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- **Athanasios Phillipopoulos**, Associate Professor, Department of Chemistry, National and Kapodistrian University of Athens (NKUA)
- **Constantinos Methenitis**, Associate Professor, Department of Chemistry, National and Kapodistrian University of Athens

Summary of the meetings and conclusion reached:

During the meetings, discussions were organized between the representatives of UNIWA, IDEC, three industrial companies (AXIA CERT LTD, BETTINA SA Company, Tsiakiris silkhouse) and the other two Universities of Athens (NTUA and NKUA) to identify the most important topics for the industrial companies about the water footprint, which will be included in the series of seminars for HEI students. The Industry Resource Group of Greece will be involved in the co-design and delivery of seminars for students.

In the first meeting, Kyriaki Kiskira and Ioannis Chronis presented the aim and tasks of the project, the main activities, and the role of the industry in the project. Then each of the industrial experts gave a summary of their company's activity. The main attention was taken to the WP3 – "Training of HEI students, on how to reduce the water footprint in the textiles sector". The industrial experts highlighted the difficulties to calculate and to reduce/manage the water footprint in different production processes. Also, action plans for how to reduce the water footprint were discussed. The technological processes in the textile industry in which consumption of water is the highest were discussed in detail.

Some questions about the tool were raised.

- Would textile factory owners know the water consumption per process step? What is best for companies?
- Should we differentiate in water consumption values per material? We could also only differentiate between materials for certain process steps. What processing steps have the largest water footprint differences per material?

In the second meeting, the most polluting technological processes and the treatment of polluted water in the textile industry and also the possibilities to reuse the water in the same or in other stages of the manufacturing were discussed. Academic partners mentioned advanced finishing technologies that helps to reduce the water and energy consumption and

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also discussed new European directives and regulations in terms of sustainability and water footprint reduction in the textile industry.

Finally, the Greek Industry Resource Group discussed the topics which have to be included into curricula of the seminars:

- Introduction of Environmental Sustainability in the Textile Industry
- Ecotextiles: The way forward for sustainable development in textiles
- Sustainable use of water in Textile Manufacturing Processes
- The treatment, management and recycling of textile industry wastewater
- Calculation of the water footprint by water footprint measuring tool (which will be created in the previous WP)

Figure 4 shows suggestions of seminar's topics after discussion. It has been agreed with them the possibility of giving a seminar on the topics presented to the students. Confirmation is pending and they will inform on which topic.

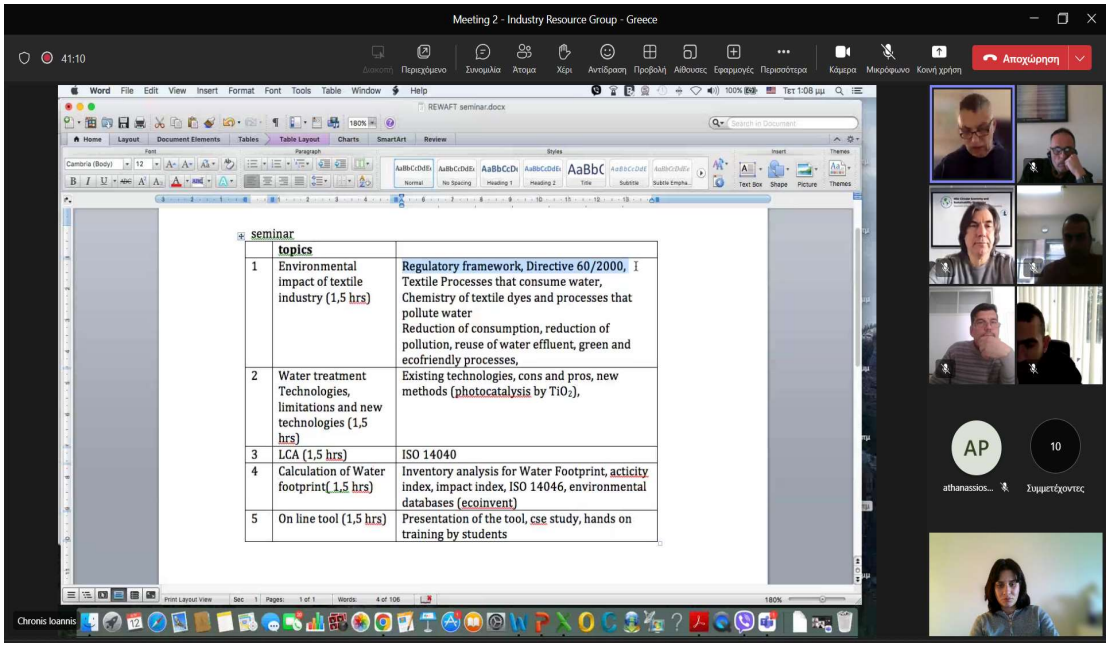

Figure 4: Second online meeting with Greek industry experts that was organized online on 12th of April by UNIWA and IDEC - Discussion about the seminar's topic

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5. Summary of the combined findings

Tables 1 shows the members of each Industrial Research Group, their information about the company/University, background etc., and also, the organization of the meetings of the Task 3.1. Organization of an Industrial Research Group.

Table 1: Industrial Research Group by country and organization of the meetings

Country/Partner(s)	Name of Industry Expert	Occupation/Position	Organization (Company/ University etc)	Field/Activities of Company
UNIWA and IDEC Greece (7 and 12 April 2023) - online	Haris Bakoloukas	Managing Director AXIA (Metallurgical Engineer, MSc)	CERT LTD	Certification Body
	Antonis Ntafos,	Production Manager (Dyehouse) (Textile Engineer)	BETTINA SA Company	Knitting/Finishing/Clothing manufacturing
	Athina Ketsitzi	Textile engineer/weaver	Tsiakiris silkhouse	Silk production
	Nikolaos Zacharopoulos	Post-Doc Researcher, (Chemist, M.Sc. PhD)	Department of Chemistry, National and Kapodistrian University of Athens (NKUA)	Inorganic and Organometallic Synthetic Chemistry, Sustainable Textiles
	Sofia Plakantonaki	Researcher (Chemical Engineering, MSc Environment and Health, Sustainable textiles)	National Technical University of Athens (NTUA), School of Chemical Engineering	Environmental Studies
	Konstantinos Kalkanis	Assistant Professor	Department of Electrical and Electronics Engineering of UNIWA	Environmental Technologies
	Athanasios Phillipopoulos	Associate Professor	Department of Chemistry, NKUA	Inorganic Chemistry
	Constantinos Methenitis	Associate Professor	Department of Chemistry, NKUA	Inorganic Chemistry

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UPV Spain (6, 11 and 12 April 2023) - Physical	Carmina Ferri Valero	CEO & Funded	Industrial company "Care Application"	A technology company that works to reduce the environmental impact generated by the textile industry through new methods and devices
	Jorge Domenech Pastor	Project Manager	Centre of Research and innovation AITEX	Centre for research, innovation and advanced technical services for the textile, garment and technical textile industrie
	Germán Bataller Olcina	Sustainability Manager	Industrial Company "Aquaclen Group"	Weaving&Knitting&Finishing
KTU and LATIA Lithuania (31 March and 13 April 2023) - online	Vydas Damalakas	Managing director (Textile engineer)	Industrial company "Omniteksas"	Knitting&Finishing
	Virginijus Vizbaras	General Director / Weaver (Textile Engineer)	Industrial company "A Grupė"	Weaving&Finishing
	Jurgita Stankuniene	Manager (Textile Engineer)	Industrial company "Utenos trikotažas"	Knitting&Finishing

The discussion with the Industrial Research Groups of the different countries resulted in some topics which have to be included into curricula of the seminars:

- Advanced finishing technologies and new machinery that help to reduce the water and energy consumption and water footprint in textiles
- The most water consuming and polluting technological processes in the textile industry and treatment of polluted water in the textile industry
- Waste management in textile companies that use water in their production process
- Sustainable dyes, pigments and chemical for textiles finishing
- Use of sustainable alternative treatments at different stages of the process to reduce water consumption
- Water Footprint calculation methodologies and tools
- Concept and methodology for calculating the water footprint

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- Published and upcoming European directives
- Regulations and legislations in terms of sustainability and water footprint reduction in the textile industry
- The current situation of the textile industry and the legal requirements in terms of sustainability and water footprint reduction expected in the coming years
- Action Plans for Water Footprint reduction
- Action Plans for treatment of polluted water in the textile industry
- LCA: ISO 14046

The questions and doubts raised from the industrial experts are:

- How many initial data will the newly developed "Tool for the measurement of the water footprint in the textiles sector" require;
- Whether the Tool is going to be general for the textile industry or focused on a specific technological process.
- Would textile factory owners know the water consumption per process step? What is best for companies?
- Should we differentiate in water consumption values per material? We could also only differentiate between materials for certain process steps. What processing steps have the largest water footprint differences per material?

It has been agreed with the experts the possibility of giving a seminar on the topics presented to the students. Confirmation is pending and they will inform on which topic.

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6. Overall conclusions of the report

The topics of the seminars for HEI students were agreed during the project meeting in Alcoy, Spain on 5th of May 2023, based on the combined findings of the previous chapter. The preparation of each seminar contains, 2 documents (1 PowerPoint file and 1-word file with notes of the slides). The total duration of the seminar is 1,5 hours. Each partner will prepare one seminar. The delivery of the seminar will be organized in 5 weeks (1 seminar per week).

The seminar topics:

- **SEMINAR 1: ADVANCED TECHNOLOGIES AND MACHINERY FOR THE WATER CONSUMPTION IN THE TEXTILE INDUSTRY** – **KTU**

  Content: Advanced finishing technologies and new machinery that help to reduce the water and energy consumption and water footprint in textiles
- **SEMINAR 2: ENVIRONMENTAL IMPACT AND WATER TREATMENT TECHNOLOGIES IN THE TEXTILE INDUSTRY** – **UNIWA**

  Content: The most water-consuming and polluting technological processes in the textile industry, the treatment of polluted water in the textile industry, and waste management in textile companies that use water in their production process
- **SEMINAR 3: SUSTAINABLE TEXTILES** – **UPV**

  Content: Sustainable dyes, pigments and chemicals for textile finishing, use of sustainable alternative treatments at different stages of the process to reduce water consumption
- **SEMINAR 4: WATER FOOTPRINT CALCULATION METHODOLOGIES AND TOOLS** –**WFN**

  Content: Water Footprint calculation methodologies and tools; Concept and methodology for calculating the water footprint

  –**SEMINAR 5: REGULATIONS AND LEGISLATIONS IN TERMS OF SUSTAINABILITY AND WATER FOOTPRINT REDUCTION IN THE TEXTILE INDUSTRY** – **LATIA**

  Content: Published and upcoming European directives, regulations and legislations in terms of sustainability and water footprint reduction in the textile industry; the current situation of the textile industry and the legal requirements in terms of sustainability and water footprint reduction expected in the coming years, Action Plans for Water Footprint reduction, LCA: ISO 14046

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