

# Report on the outcomes of a Virtual Mobility

CA20101 - Plastics monitoRING detectiOn RemedIaTion recoverY  
(PRIORITY)

**Bridging the Gap: Diversity and Inclusion  
in CA20101 Plastic Detection**

**21/08/2023 to 30/10/2023**

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## INTRODUCTION TO DEI (DIVERSITY EQUALITY INCLUSION) GROUP

The creation of the Diversity, Equality and Inclusion (DEI) group within COST Action CA20101 - Plastics monitoring detection Remediation recovery (PRIORITY) was overseen by Mariasole Bannò, professor of Management and Economics at the University of Brescia and head of Equality, and Camilla Federici, Cost Action's Equality advisor.

DEI Group is a cross-cutting group connected to different groups in the COST Action CA20101 through specific points of contact.

The primary goal of the DEI group is to promote diversity, equality and inclusion within the Cost PRIORITY. Action CA20101 is a research project that brings together institutions from many countries.

The inclusion policy of this project is developed along three key dimensions of diversity:

- Geographic distribution;
- Career stage: involvement of young researchers and researchers;
- Gender balance.

The DEI strategy aims to promote an inclusive approach among diverse researchers and working groups, with the goal of enhancing the content within these groups.

Three main subgroups have been identified that correspond to the main tasks of the project:

- Network facilitation;
- Research enrichment: through awareness raising and educational activities on diversity, equality and inclusion;
- Communication and dissemination: through the creation of a Newsletter and useful content that will be posted on the website.

The primary commitment of the action concerns promoting an inclusive approach through two parallel lines of action. The first relates to the analysis of the current scenario, i.e., the "state of the art," through the analysis of the data available to COST participants by segmenting them along the three diversity drivers outlined earlier to have a general overview and subsequently be able to select the most efficient actions, activities and identify KPIs that will allow progress to be analyzed. The second involves offering outreach activities to benefit all COST participants.

In this section, we analysed the database available to CA20101 participants. The analysis was done considering the data at 30 July 2023 for two different levels of detail: at the overall action level, considering all participants (408) and at the DEI Group level (25).

Since COST Actions are always open to new entrants, the same AS-IS scenario may change over time and must therefore be kept in constant update based on new accessions.

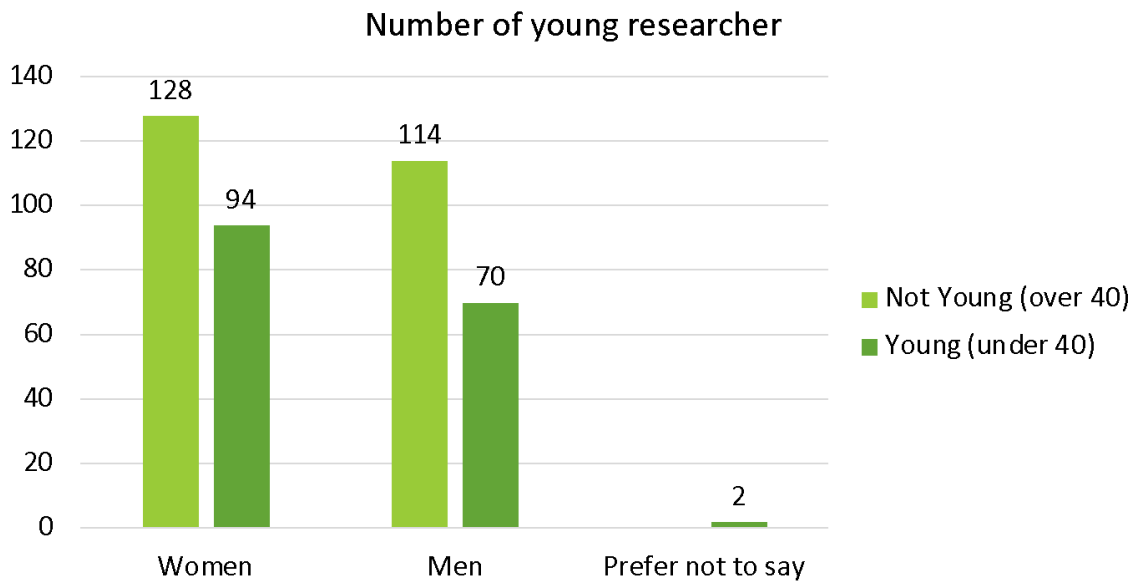
Three main guidelines were used to analyze diversity: gender balance (Women, Men, Prefer not to say), geographic distribution (ITC or not ITC), and career stage (young or not young).

Based on age, a member is considered young if he or she is younger than 40 years old and vice versa not young if 40 years old or older. The second guideline mentioned above (geographical distribution) includes the less research-intensive COST members, known as COST Inclusiveness Target Countries (ITC). The current list of ITC countries includes Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Georgia, Greece, Hungary, Lithuania, Latvia, Malta, Moldova, Montenegro, Poland, Portugal, Romania, Slovenia, Slovakia, North Macedonia,

Serbia, Turkey, and Ukraine. For gender, the following options were considered: women, men, and 'prefer not to say'.

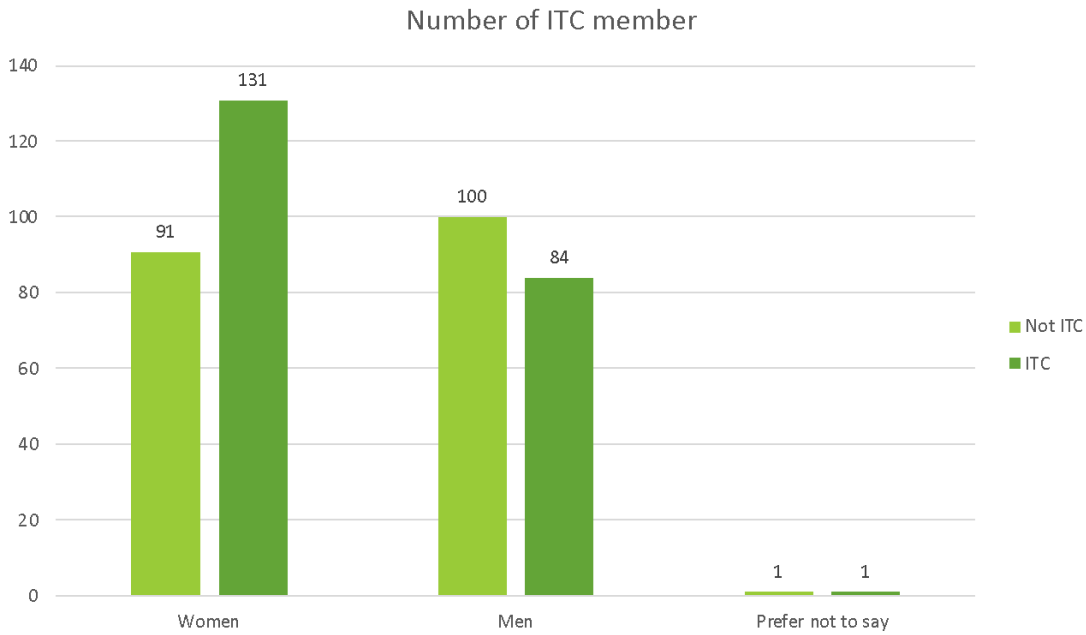
**DESCRIPTIVE ANALYSIS**

Figure 1 reports the CA20101 members categorized by both gender and career stage. This graphical representation offers valuable insights into the distribution of individuals across various career stages, highlighting any gender disparities within this cohort. There are more women (128) than men (114) among CA20101 members who fall under the "Not Young" category (over 40 years old). Among members under 40 years old, represented in the "Young" category, there are still more women (94) than men (70).



**Figure 1 - CA20101 members divided by gender and career stage.**

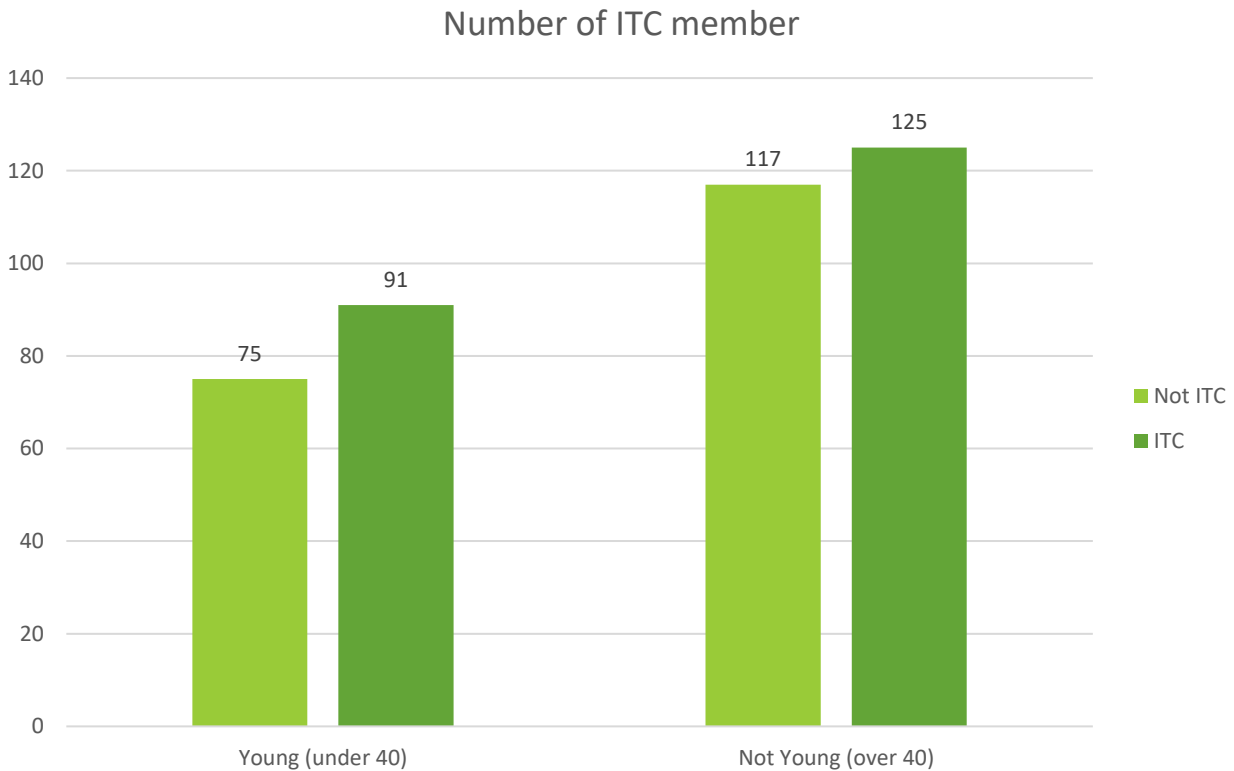
Figure 2 reports CA20101 members categorized by gender and whether they reside in an ITC country or a Non-ITC country. This graphic provides valuable insight into the geographical distribution and gender composition of CA20101 members, shedding light on how the organization's membership is distributed across regions and whether geographic factors influence gender disparities. Among CA20101 members originating from ITC countries, there is a notable predominance of women (131) compared to men (84). Regarding members from countries not classified as ITC, the gender distribution is more even, with 91 women and 100 men. This reflects a diverse representation stemming from various sectors and geographic regions among CA20101 members.



**Figure 2 - CA20101 members divided by gender and ITC or Not ITC country.**

Figure 3, presents CA20101 members categorized by their career stage and whether they reside in ITC or non-ITC countries. This graphic provides a comprehensive view of the distribution of members across different career stages and regions, shedding light on how CA20101 membership varies in terms of career progression and geographical location.

Among members over 40 (labeled as "Not Young"), there are 125 individuals from ITC countries and 117 from non-ITC countries. In the "Young" category (members under 40), there are 91 individuals from ITC countries and 75 from non-ITC countries.



**Figure 3 - CA20101 members divided by career stage and ITC or Not ITC country.**

CA20101 boasts a highly diverse membership, with participants from a wide range of countries worldwide (Figure 4). This diversity is essential for promoting a rich exchange of ideas and fostering international collaboration in research and technology. Some countries have many members, indicating strong participation and engagement with CA20101. Notable examples include Turkey (TR), with 70 members, Italy (IT) with 53, Spain (ES) with 44, and Portugal (PT) with 24. These countries contribute significantly to the organization's activities.

The presence of members from countries with smaller numbers, such as Cyprus (CY), Finland (FI), Iceland (IS), and Nigeria (NG), underscores CA20101's commitment to inclusivity by accommodating diverse perspectives from regions with fewer participants.

The data reveals the development of regional networks, as seen in the higher representation of members from neighbouring countries. For instance, Serbia (RS) and Spain (ES) have 37 and 44 members, respectively, indicating regional solid participation.

The United States (US), despite having only one member in this dataset, exemplifies CA20101's global character, drawing participants from around the world.



**Figure 4 - Geographical representation of CA20101 members.**

Figure 5 displays the membership distribution within the Working Group 1 focused on “Impacts and Risks on Human Health and Environment Related to N/MPs.” The data is further categorized into three key dimensions: gender diversity, the classification of ITC or non-ITC countries, and career stage.

In the group of members over the age of 40 (Not Young), there are a total of 115 individuals’ participant to the working group 1. Among them, 63 are women (18 Not ITC and 45 ITC) and 52 are men (31 Not ITC and 21 ITC).

As for members under the age of 40 (Young), the total is 73 individuals among them, 52 are women (19 Not ITC and 33 ITC) and 20 are men (9 Not ITC and 11 ITC), there is also a Prefer not to say in a Not ITC country.

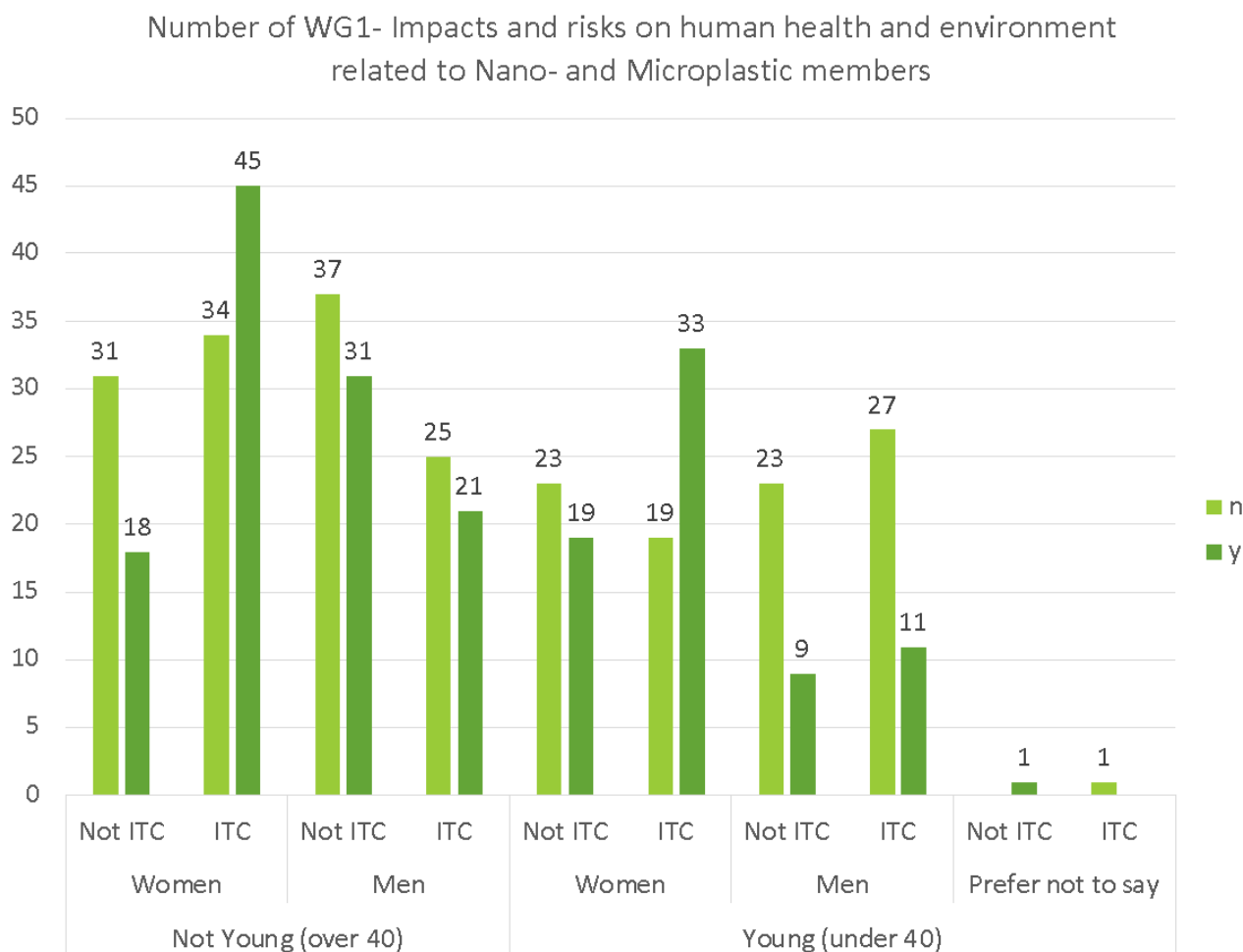


Figure 5 - Representation of the membership distribution within Working Group 1.

Figure 6 displays the membership distribution within the Working Group 2 focused on “Monitoring and sampling Microplastics”. The data is further categorized into three key dimensions: gender diversity, the classification of ITC or non-ITC countries, and career stage.

In the group of members over the age of 40 (Not Young), there are a total of 115 individuals’ participant to the working group 2. Among them, 69 are women (19 Not ITC and 50 ITC) and 46 are men (25 Not ITC and 21 ITC).

As for members under the age of 40 (Young), the total is 84 individuals among them, 43 are women (18 Not ITC and 25 ITC) and 40 are men (20 Not ITC and 20 ITC), there is also a Prefer not to say in a Not ITC country.

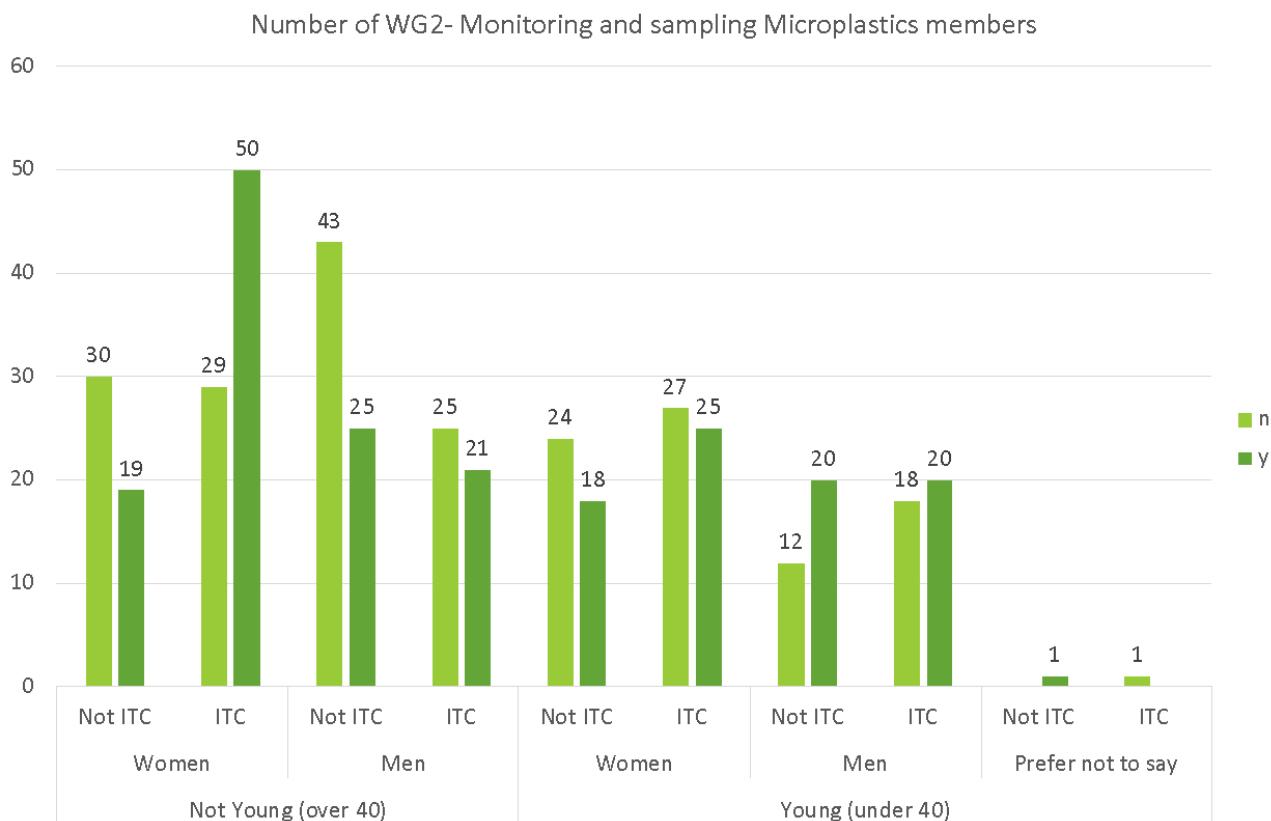


Figure 6 - Representation of the membership distribution within Working Group 2.

Figure 7 displays the membership distribution within the Working Group 3 focused on “Instrumentation, modelling, data evaluation, software, and analytical procedures”. The data is further categorized into three key dimensions: gender diversity, the classification of ITC or non-ITC countries, and career stage.

In the group of members over the age of 40 (Not Young), there are a total of 104 individuals’ participant to the working group 3. Among them, 55 are women (21 Not ITC and 34 ITC) and 49 are men (28 Not ITC and 21 ITC).

As for members under the age of 40 (Young), the total is 71 individuals among them, 34 are women (18 Not ITC and 16 ITC) and 36 are men (21 Not ITC and 15 ITC), there is also a Prefer not to say in a Not ITC country.

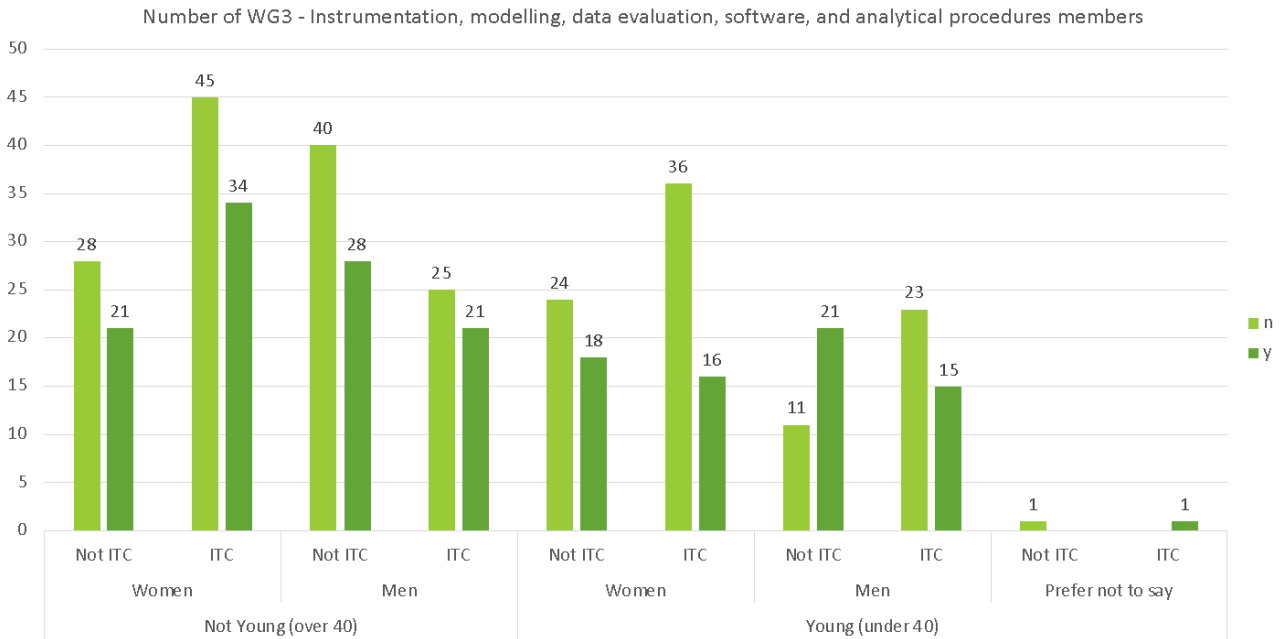


Figure 7 - Representation of the membership distribution within Working Group 3.

Figure 8 displays membership distribution within Working Group 4 focused on “Nanoplastics”. The data is further categorized into three key dimensions: gender diversity, the classification of ITC or non-ITC countries, and career stage.

In the group of members over the age of 40 (Not Young), there are a total of 97 individuals’ participant to the working group 4. Among them, 46 are women (16 Not ITC and 30 ITC) and 51 are men (29 Not ITC and 22 ITC).

As for members under the age of 40 (Young), the total is 61 individuals among them, 35 are women (19 Not ITC and 16 ITC) and 25 are men (13 Not ITC and 12 ITC), there is also a Prefer not to say in a Not ITC country.

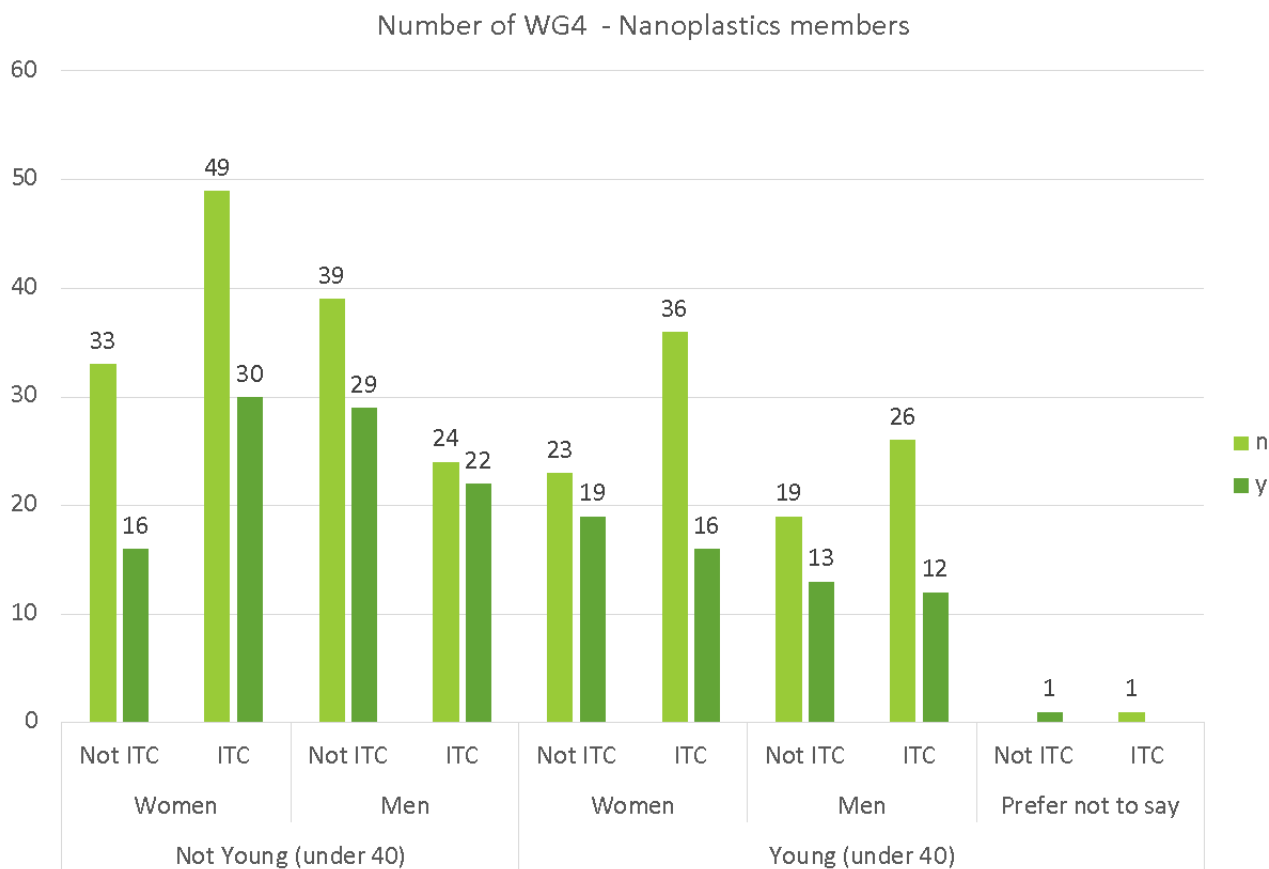


Figure 8 - Representation of the membership distribution within the Working Group 4

Figure 9 displays the membership distribution within Working Group 5 focused on “Remediation, recovery and development of sustainable alternative to plastic materials”. The data is further categorized into three key dimensions: gender diversity, the classification of ITC or non-ITC countries, and career stage.

In the group of members over the age of 40 (Not Young), there are a total of 87 individuals’ participant to the working group 5. Among them, 47 are women (14 Not ITC and 33 ITC) and 40 are men (23 Not ITC and 17 ITC).

As for members under the age of 40 (Young), the total is 64 individuals, among them, 34 are women (10 Not ITC and 24 ITC) and 30 are men (13 Not ITC and 17 ITC).

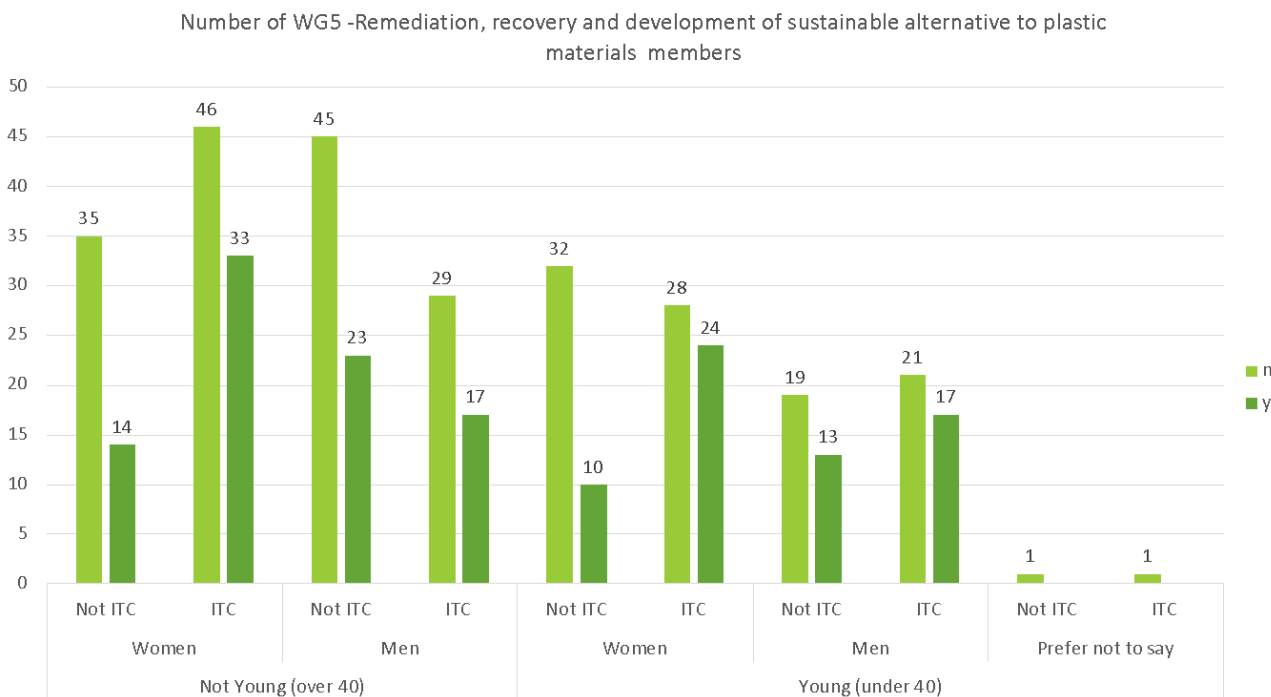


Figure 9 - Representation of the membership distribution within Working Group 5.

Figure 10 displays membership distribution within the Working Group 6 focused on “Metrology and standardization”. The data is further categorized into three key dimensions: gender diversity, the classification of ITC or non-ITC countries, and career stage.

In the group of members over the age of 40 (Not Young), there are a total of 57 individuals’ participant to the working group 6. Among them, 36 are women (16 Not ITC and 20 ITC) and 21 are men (14 Not ITC and 7 ITC).

As for members under the age of 40 (Young), the total is 39 individuals, among them, 21 are women (13 Not ITC and 8 ITC) and 17 are men (9 Not ITC and 8 ITC), there is also a Prefer not to say in a Not ITC country.

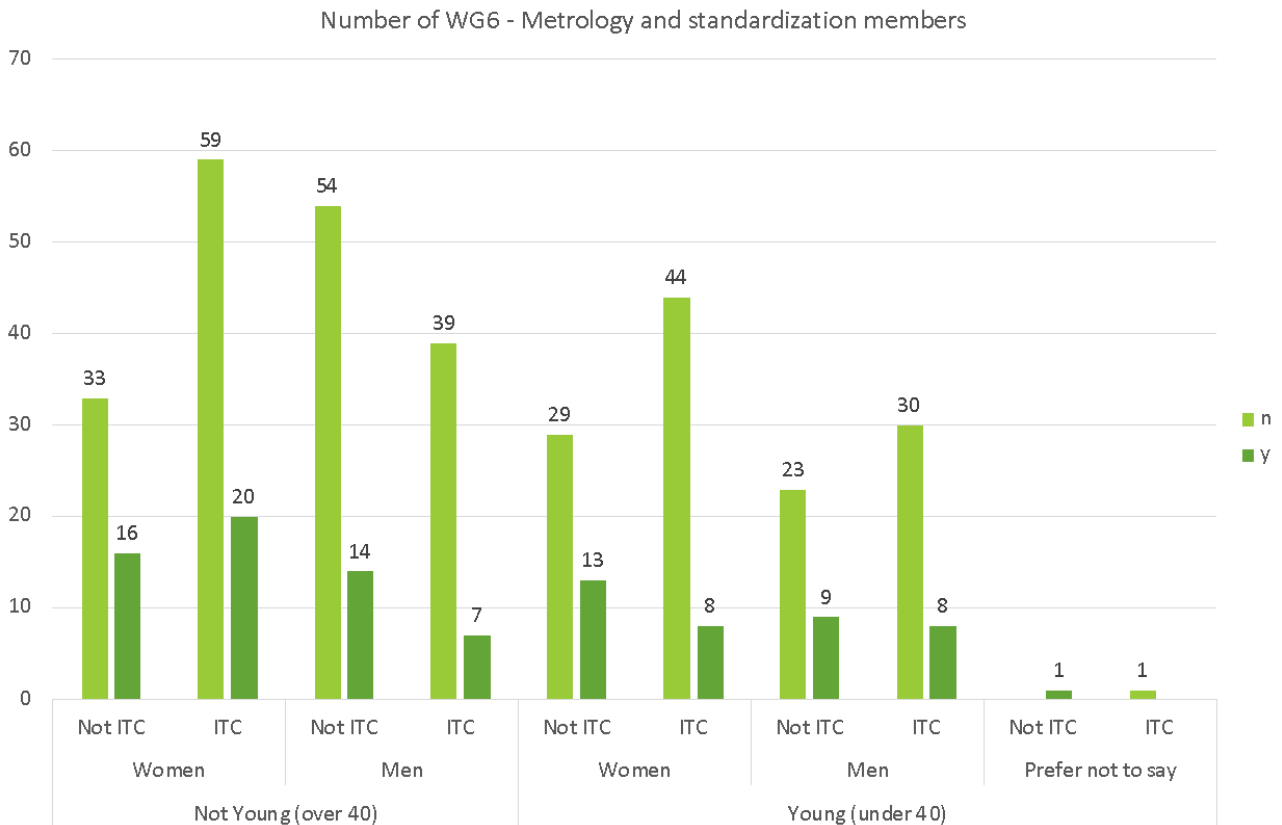


Figure 10 - Representation of the membership distribution within Working Group 6.

Figure 11 displays the membership distribution within the Working Group 7 focused on “Develop new strategies to increase the synergies with society and education”. The data is further categorized into three key dimensions: gender diversity, the classification of ITC or non-ITC countries, and career stage.

In the group of members over the age of 40 (Not Young), there are a total of 71 individuals’ participant to the working group 7. Among them, 44 are women (12 Not ITC and 32 ITC) and 27 are men (10 Not ITC and 17 ITC).

As for members under the age of 40 (Young), the total is 43 individuals, among them, 26 are women (6 Not ITC and 20 ITC) and 17 are men (6 Not ITC and 11 ITC).

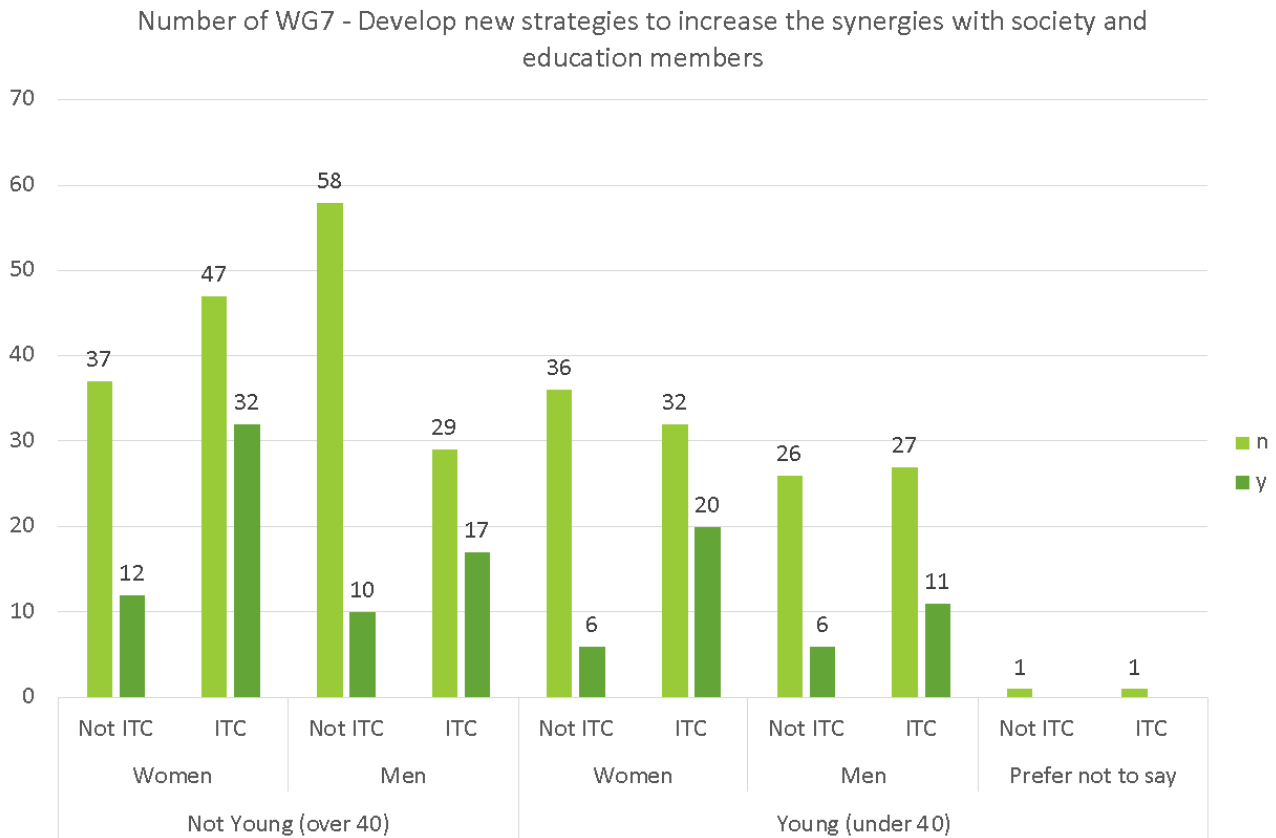


Figure 11 - Representation of the membership distribution within Working Group 7.

Figure 12 displays the membership distribution within the DEI group. The data is further categorized into three key dimensions: gender diversity, the classification of ITC or non-ITC countries, and career stage.

In the group of members over the age of 40 (Not Young), there are a total of 14 individuals' participant. Among them, 9 are women (4 Not ITC and 5 ITC) and 5 are men (3 Not ITC and 2 ITC). As for members under the age of 40 (Young), the total is 10 individuals, among them, 4 are women (2 Not ITC and 2 ITC) and 5 are men (1 Not ITC and 4 ITC), there is also a Prefer not to say in a Not ITC country.

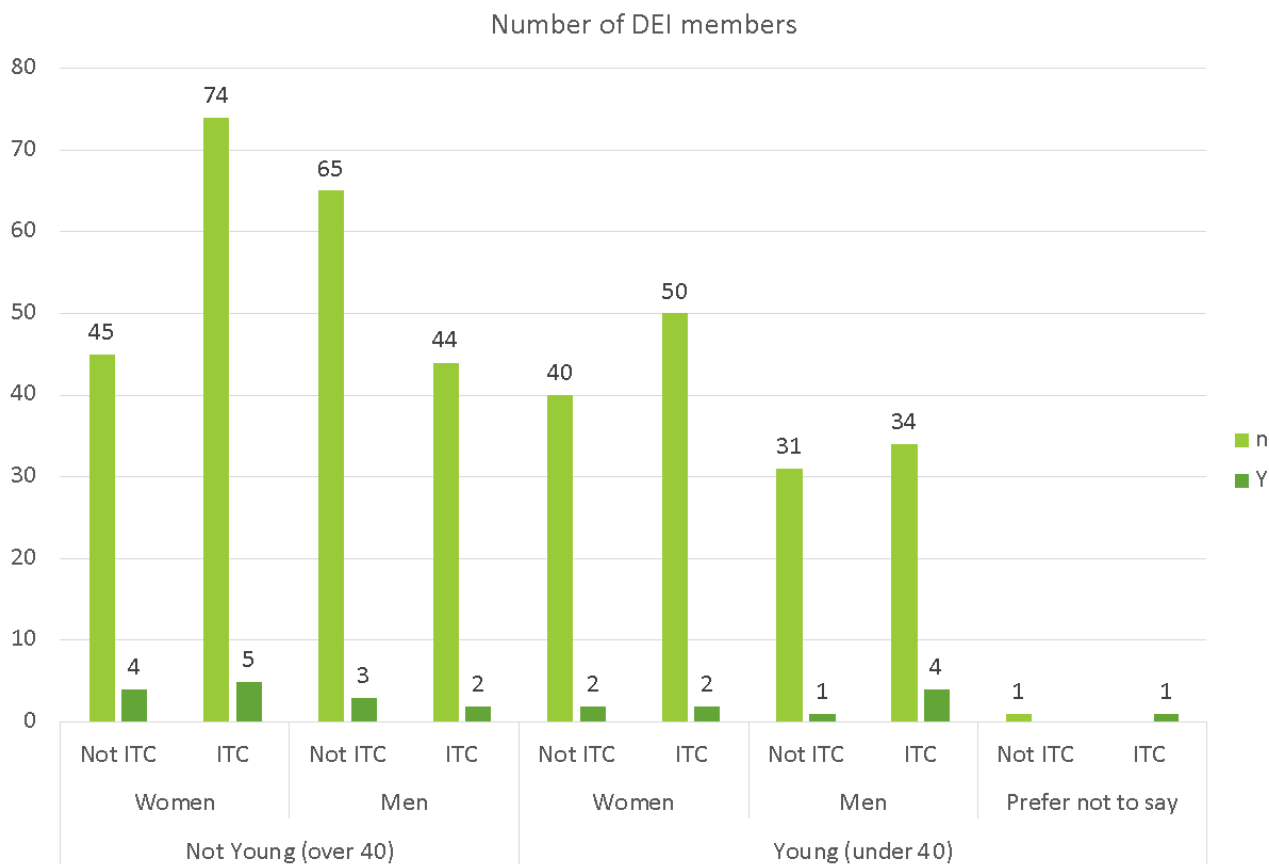


Figure 12 - Representation of the membership distribution within DEI groups.

## ANALYSIS SCIENTIFIC RELEVANCE COMPONENTS

Figure 13 provides an intriguing overview of the average H-Index within the CA20101 membership, with a clear distinction based on gender and geographical origin.

For members over 40, the average H-Index is higher for men (27.05) than women (18.80), indicating a tendency for a greater research impact and contribution by men in this age group. Furthermore, among members from non-ITC countries, both women (24.82) and men (30.51) exhibit significantly higher average H-Indexes compared to those from ITC countries.

For members under 40, the average H-Index is notably lower, a common occurrence at this stage of their career. Here too, men (11.66) have a higher average H-Index compared to women (7.57). The difference between members from ITC and non-ITC countries is also apparent in this age group, with a higher average H-Index for those from non-ITC countries.

For the category includes members who preferred not to specify their gender. There is a notable difference, with an average of 4.00 for "Young" members and 3.00 for "Young" members from non-ITC countries and 2.00 for "Young" members from ITC, showing less variation in authorship position within this subgroup.

Figure 13 suggests that the average H-Index is higher among men than women and among members from non-ITC countries compared to those from ITC countries. These differences may reflect

variables such as access to research resources, career opportunities, and other influences that can vary based on gender and geography.

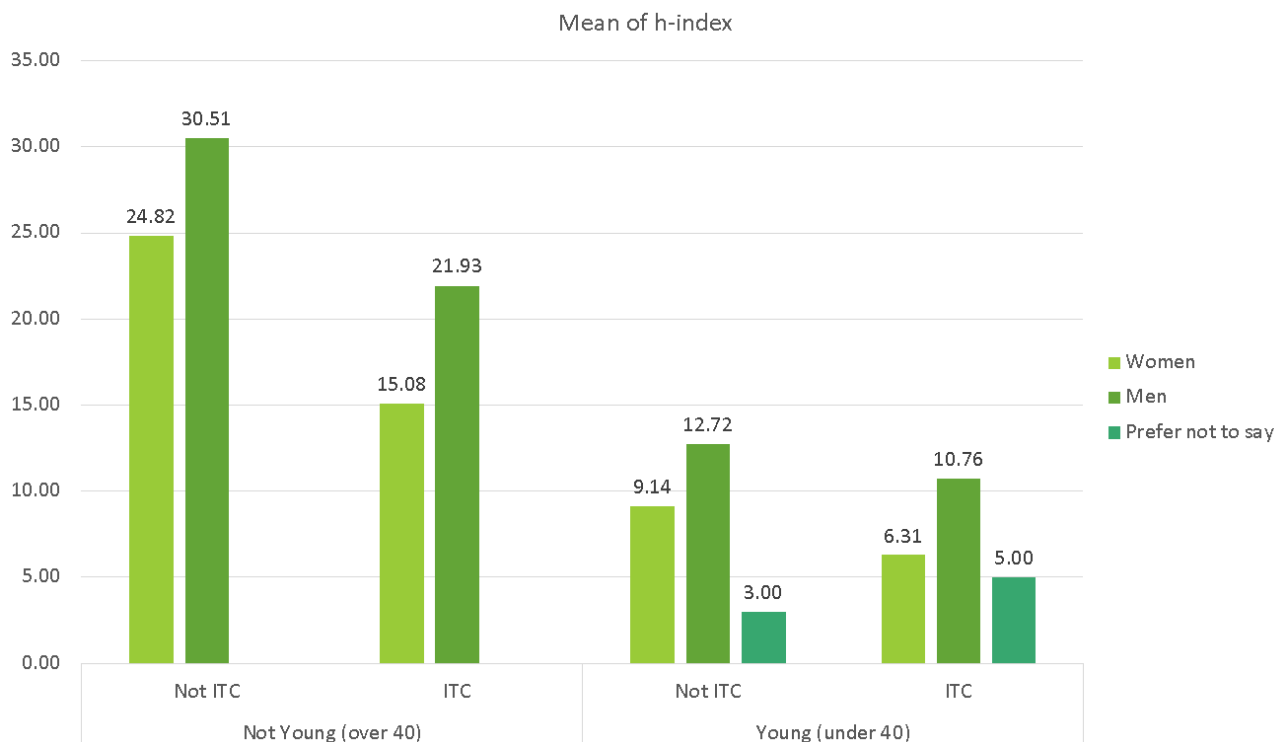


Figure 13 – Mean of H-index.

Figure 14 provides an intriguing overview of the average number of publications within the CA20101 membership, clearly distinguishing between gender and geographical origin.

Among "Not Young" members (those over 40), there is an average of 65.88 publications for women and 103.67 for men. This difference suggests a higher level of publishing activity among men in this age group. Furthermore, among members from non-ITC countries, both women (88.08) and men (111.85) have, on average, a higher number of publications compared to those from ITC countries.

For members under 40 ("Young"), the average number of publications is notably lower, which is common at this early stage of their career. Here too, it is observed that men (38.04) have a higher average of publications compared to women (18.28). The difference between members from ITC and non-ITC countries is also evident in this age group, with a higher average of publications for those from non-ITC countries.

The category includes members who preferred not to specify their gender. There is a notable difference, with an average of 4.50 for "Young" members and 3.00 for "Young" members from non-ITC countries and 6.00 for "Young" members from ITC.

Figure 14 suggests a significant difference in the average number of publications between genders, with men publishing more on average than women. Additionally, members from non-ITC countries appear to publish more on average compared to those from ITC countries.

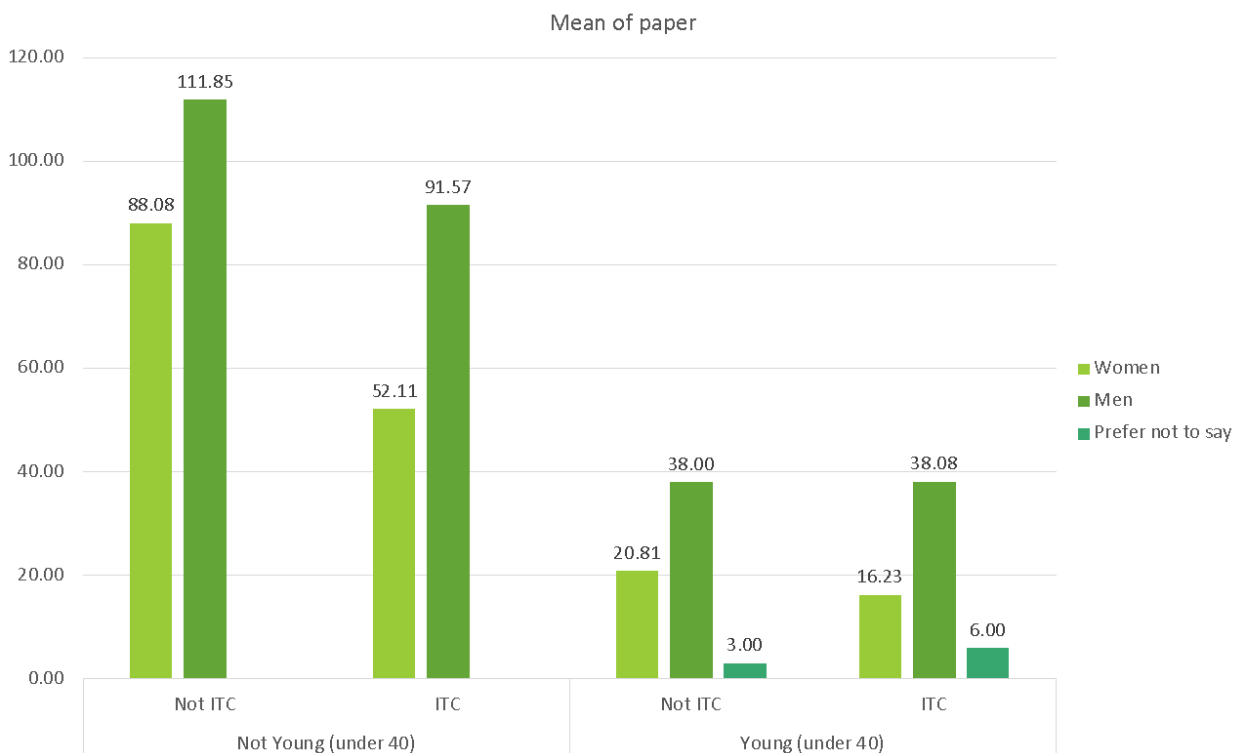


Figure 14 - Mean of paper.

Figure 15 provides an insightful view of the average number of citations within the CA20101 membership, with clear distinctions based on gender and geographical origin.

For members over 40, the average number of citations is notably higher for men (3518.29) compared to women (1825.65). This discrepancy indicates a greater impact of research and more citations for men in this age group. Additionally, among members from non-ITC countries, both women (3100.41) and men (4047.78) have a significantly higher average number of citations compared to those from ITC countries.

For members under 40 ("Young"), the average number of citations is considerably lower, which is common at the early stages of one's research career. Here, too, men (743.94) have a higher average number of citations compared to women (467.10). The difference between members from ITC and non-ITC countries is also evident in this age group, with a higher average number of citations for those from non-ITC countries.

For the category includes members who preferred not to specify their gender. There is a notable difference, with an average of 98.50 for "Young" members from non-ITC countries and 65.00 for "Young" members from ITC.

In summary, Figure 15 indicates a notable difference in the average number of citations between genders, with men receiving more citations on average than women. Furthermore, members from non-ITC countries tend to have a higher average number of citations than those from ITC countries. These differences suggest variations in the impact and recognition of research outputs, highlighting the importance of addressing gender disparities and ensuring equitable access to research opportunities. The data underscores a longstanding and confirmed issue: women are not included in influential networks, and men tend to cite other men, perpetuating a negative feedback loop. This pattern seems to repeat for ITC (Inclusiveness Target Countries) as well, resulting in them being cited

less and remaining on the outskirts of the research network. This reflects an issue of intersectionality that is compounded: women and ITC countries (excluding young members) face reduced recognition and citations, contributing to persistent disparities and limited participation in crucial research domains.

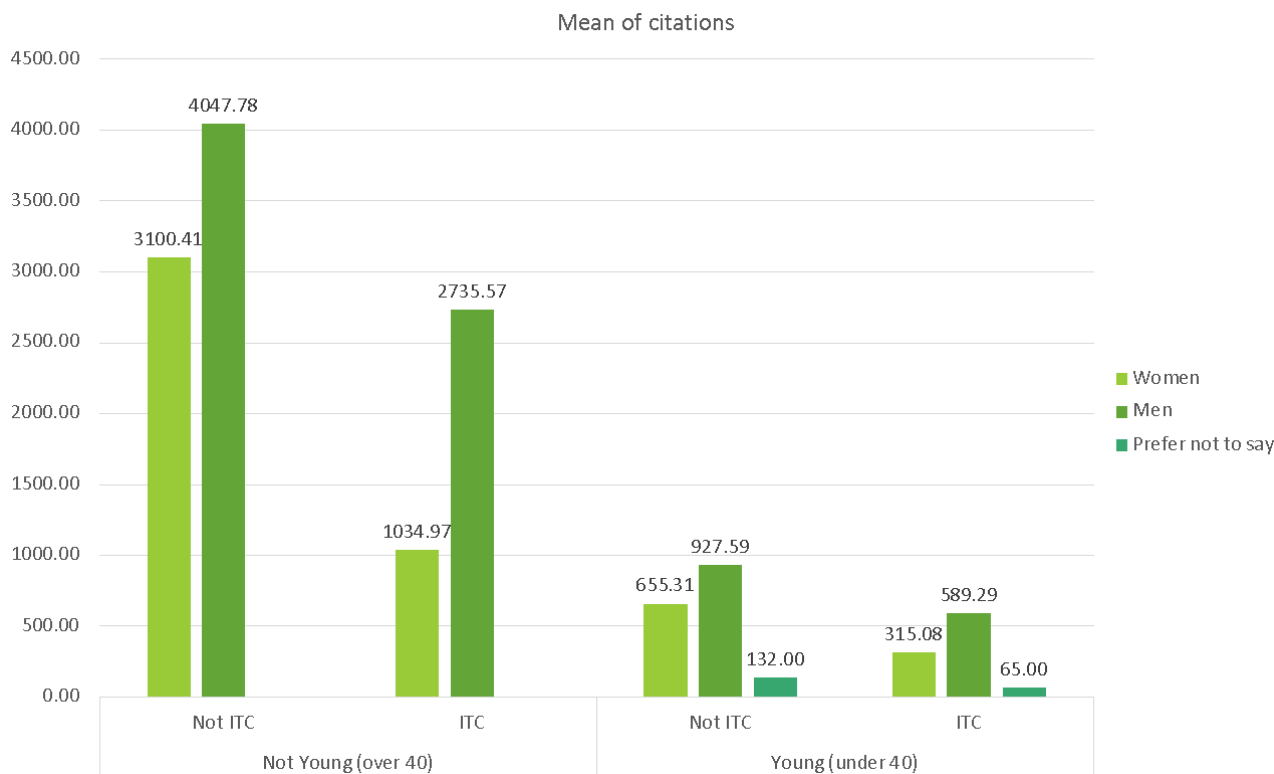


Figure 15 - Mean of citations.

Figure 16 provides an interesting perspective on the frequency with which authors appear as the first author within the CA20101 membership. The data reveals some notable trends.

Among members over 40, men have an average of 14.75 instances as the first author, while women average 9.92. This suggests that men are more often positioned as the first author in research publications within this age group.

Interestingly, among members from non-ITC countries, the average number of times an author appears as the first author is notably higher for women (15.75) than men (13.76), indicating a unique dynamic in non-ITC countries for this age group.

For members under 40 ("Young"), the average number of times an author appears as the first author is lower. Men average 9.12, while women average 5.16, indicating that men are more likely to be first authors in this age group. It's worth noting that for members from non-ITC countries, men again have a higher average (10.32) compared to women (5.82), reinforcing the trend of male dominance in terms of first authorship.

This category includes members who preferred not to specify their gender. There is a notable difference, with an average of 1.00 for "Young" members and 0.00 for "Not Young" members from non-ITC countries, showing less variation in authorship position within this subgroup.

Figure 16 indicates that, on average, men tend to appear as the first author more frequently than women in both "Not Young" and "Young" age groups. However, an interesting contrast is observed

within non-ITC countries for members over 40, where women have a higher average as first authors. These findings suggest a gender-based disparity in first authorship positions, with men often taking the lead.

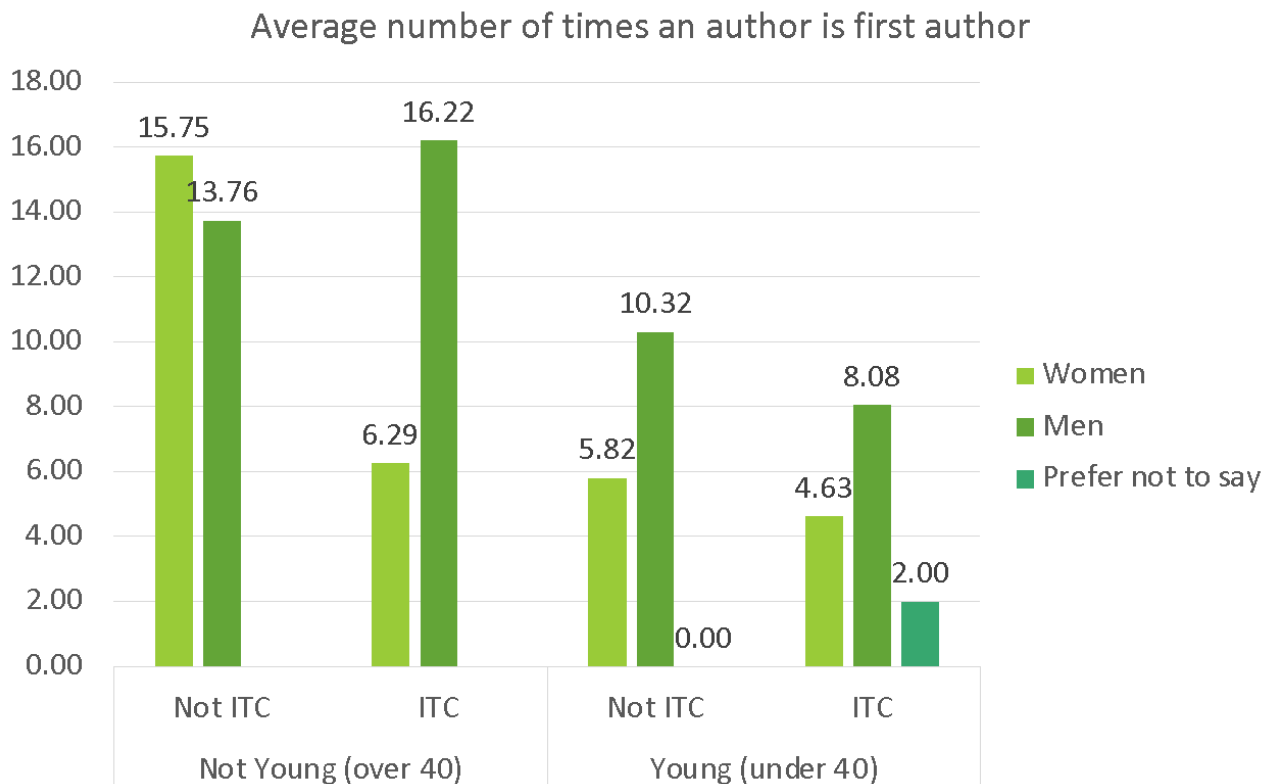


Figure 16 - Average number of times an author is first author.

Figure 17 offers insights into the average occurrence of authors appearing as the last author within the CA20101 membership. The data reveals some notable trends.

Among members over 40, men have an average of 26.56 instances as the last author, while women average 14.03. This suggests that men more frequently assume the last author position in research publications within this age group.

Remarkably, among members from non-ITC countries, both women and men have similar average numbers as the last author, with women averaging 26.44 and men averaging 25.85, indicating a relatively balanced dynamic in non-ITC countries for this age group.

For members under 40 ("Young"), the average number of times an author appears as the last author is notably lower. Men average 3.03, while women average 1.91, suggesting that men are still more likely to be the last author in this age group. It's important to note that for members from non-ITC countries, men have a slightly higher average (2.77) than women (2.16), continuing the trend of male dominance in the last author position.

This category includes members who preferred not to specify their gender. There is variation within this group, with an average of 1.00 for "Young" members and 0.00 for "Not Young" members from non-ITC countries, indicating differences in authorship position within this subgroup.

Figure 17 suggests that, on average, men appear as the last author more frequently than women in both "Not Young" and "Young" age groups. However, a notable exception is observed within non-ITC countries for members over 40, where women and men have similar averages in the last author

position. These findings highlight gender-based disparities in the last authorship position, with men often holding this position more frequently.

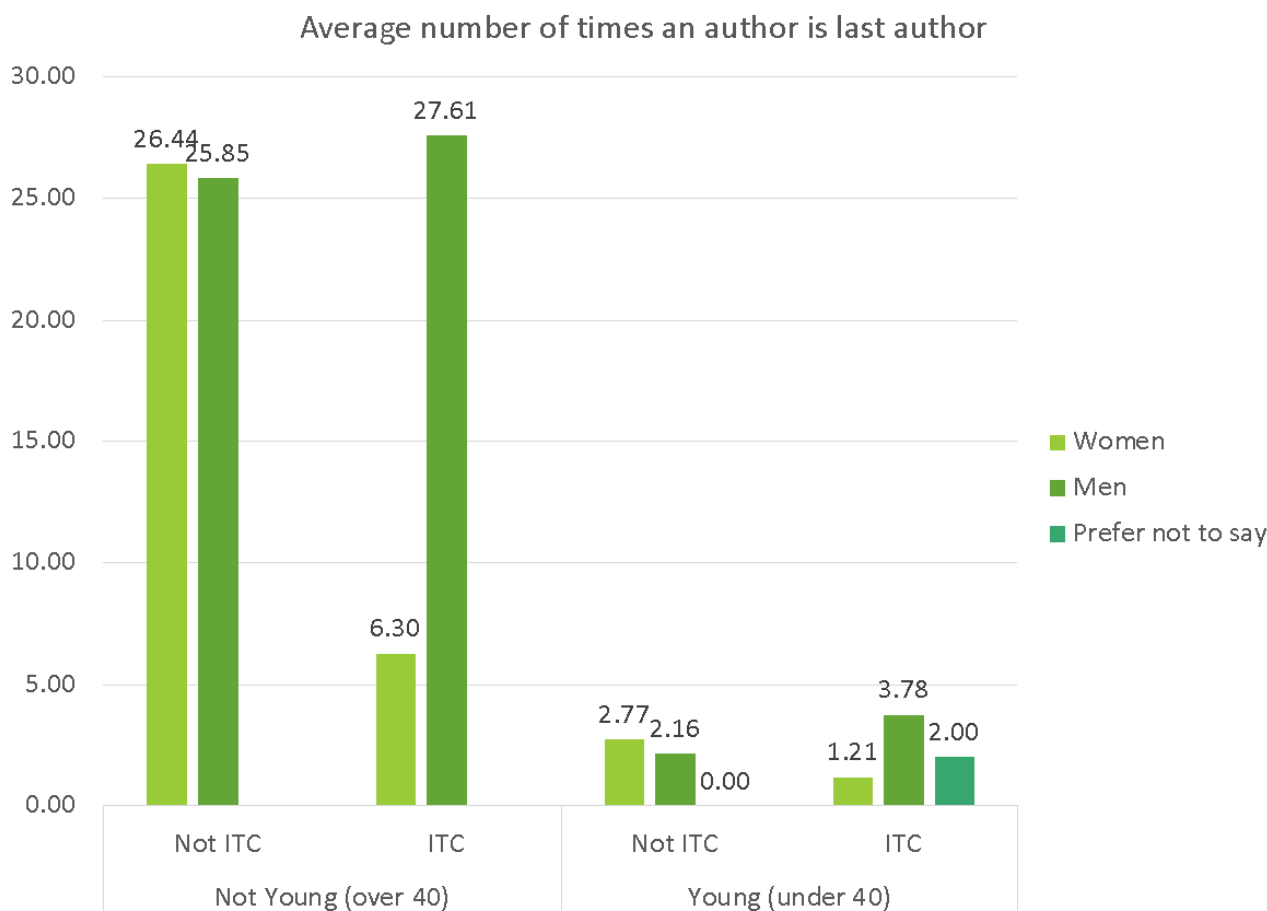


Figure 17 - Average number of times an author is last author.

Figure 18 provides insights into the average occurrence of authors acting as the sole author within the CA20101 membership. The data reveals some interesting trends.

Among members over 40, men have an average of 1.48 instances as the sole author, while women average 0.69. This suggests that men are more frequently the sole authors in research publications within this age group.

Surprisingly, among members from non-ITC countries, women have a higher average (1.52) than men (1.09) as sole authors, suggesting a gender-based variation in this age group for non-ITC countries.

For members under 40 ("Young"), the average number of times an author is the sole author is relatively low. Men average 0.33, while women average 0.14, pointing to a gender difference with men having slightly more occurrences as sole authors in this age group.

It's worth noting that for members from non-ITC countries, both men and women have a low average occurrence as sole authors, with men having a slightly higher average (0.16) than women (0.00).

This category includes members who preferred not to specify their gender. Within this group, there is little variation, with a minimal average occurrence of being the sole author, especially among young members.

Figure 17 suggests that, on average, men appear as sole authors more frequently than women in both "Not Young" and "Young" age groups. However, the data reveals some interesting variations, particularly within non-ITC countries, where women have a higher average as sole authors among members over 40.

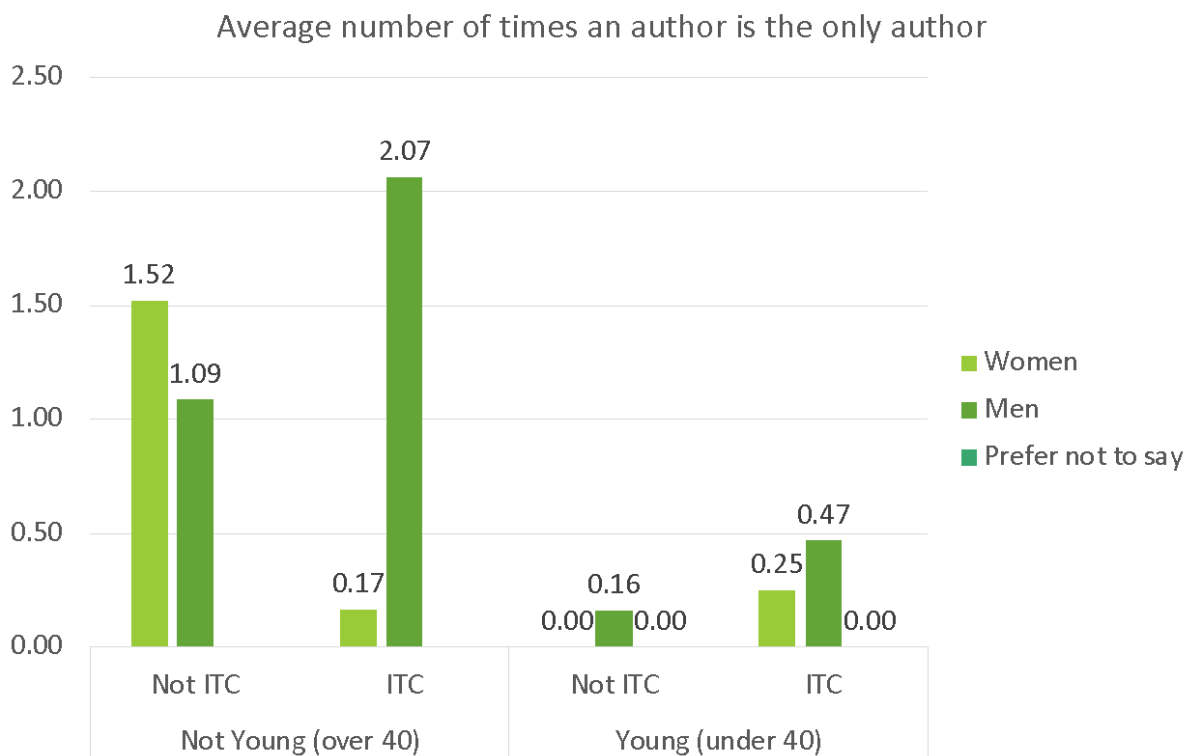


Figure 18 - Average number of times an author is the only author

## MOTIVATIONS ANALYSIS

Performing topic modeling, no words appear within the identified topics that invoke the three components of diversity: Gender Balance, Geographic Distribution (ITC or Non-ITC) and Career Phase (Young or Not Young).

Specifically, the 7 topics found mention:

- 1- Cost-Effective Approaches for Knowledge Exchange in Plastic Research
- 2- Microplastic Research and Environmental Impact
- 3- Synthetic vs. Organic: Characterizing Plastic Products in Research
- 4- Addressing Microplastic Pollution: Treatment and Degradation Strategies
- 5- Recognizing Excellence and Innovation in Plastic Research
- 6- Polymer Development and Enzymatic Innovations
- 7- Institutional Challenges and Global Implications of Plastic Research

Table 1 provides an overview of the topics discussed within the context of plastic research, along with the number of people involved in each topic. This table sheds light on the distribution of interest and engagement within the research community, highlighting the following key points:

Cost-Effective Approaches for Knowledge Exchange in Plastic Research (Topic 1): This topic attracts the highest number of participants, with 360 individuals engaged in exploring cost-effective approaches for knowledge exchange in the field of plastic research. This suggests a strong interest in knowledge dissemination and collaboration within this domain.

Microplastic Research and Environmental Impact (Topic 2): Topic 2 focuses on microplastic research and its environmental impact, involving 40 individuals. It highlights the importance of understanding the environmental consequences of microplastics and the need for collaborative efforts in this area.

Polymer Development and Enzymatic Innovation (Topic 6): This topic has the participation of four individuals and centers on polymer development and enzymatic innovation. It likely represents a specialized and niche area of research within the broader field of plastics.

Addressing Microplastic Pollution: Treatment and Degradation Strategies (Topic 4): With only one participant, Topic 4 is an area of research dedicated to addressing microplastic pollution through treatment and degradation strategies. Although small in participation, it underscores the significance of research on mitigating microplastic pollution.

Synthetic vs. Organic: Characterizing Plastic Products in Research (Topic 3): Similar to Topic 4, this topic has just one participant and is dedicated to characterizing plastic products, specifically comparing synthetic and organic aspects in research.

Recognizing Excellence and Innovation in Plastic Research (Topic 5): Topic 5, which centers on recognizing excellence and innovation in plastic research, has one participant. It likely serves as a platform for acknowledging outstanding contributions in the field.

**Table 1 – Number of motivations assigned to each topic.**

Topic N°	Title of the topic	N° of people
1	Cost-Effective Approaches for Knowledge Exchange in Plastic Research	360
2	Microplastic Research and Environmental Impact	40
6	Polymer Development and Enzymatic Innovation	4
4	Addressing Microplastic Pollution: Treatment and Degradation Strategies	1
3	Synthetic vs. Organic: Characterizing Plastic Products in Research	1
5	Recognizing Excellence and Innovation in Plastic Research	1

To check more specifically whether someone in their Motivation mentioned some themes related to the three dimensions of the from verses studied, it was decided to apply an algorithm that includes the similarity of a text to specifically assigned themes:

**Table 2 - Keywords selected for the application of the algorithm.**

Topic	Words
<b>Gender Balance</b>	Gender, women, diversity, Inclusivity, sex, equal, female, woman
<b>Geographic Distribution (ITC or Non-ITC)</b>	Developing countries, ethnicity, International
<b>Career Phase</b>	Age, young, old, career, seniority, expert

<b>(Young or Not Young)</b>	
<b>Asia</b>	Asia
<b>Africa</b>	Africa
<b>North America</b>	North America
<b>South America</b>	South America
<b>Antarctica</b>	Antarctica
<b>Europe</b>	Europe
<b>Australia</b>	Australia

70% as the similarity value was chosen as the threshold for attributing or not attributing Motivation to one of the three identified areas.

The results of the association indicate the level of motivation within the CA20101 community to address specific research topics and initiatives. The table highlights the number of individuals who have expressed motivation ("YES") and those who have not ("NO") for various factors, including gender balance, geographic distribution, career phase, and regional focus.

**Gender Balance and Motivation:** Notably, three individuals have expressed motivation for promoting gender balance within the research community, while a larger majority of 405 individuals have not explicitly expressed a motivation in this regard. This suggests that a substantial portion of the community may not have specifically addressed or prioritized gender balance as a motivation within the context of this research association.

**Geographic Distribution and Motivation:** Similarly, for the geographic distribution factor (ITC or non-ITC countries), three individuals have expressed motivation, while 405 have not. This indicates that the majority may not have explicitly mentioned geographic distribution as a key motivation.

**Career Phase and Motivation:** Only two individuals have expressed motivation for considering career phase (Young or Not Young) as a factor of importance, while 406 individuals have not explicitly mentioned it. This suggests that the career phase may not be a predominant factor in the motivation of the majority of the community.

**Regional Focus and Motivation:** The table further breaks down the regional focus, revealing that 23 individuals have expressed motivation for research related to Europe, while 385 have not. No expressed motivation exists for research focused on North America, South America, Australia, Antarctica, Asia, or Africa. This could indicate a more limited regional focus within the association. The results of the association reveal variations in the motivations of the CA20101 research community. While some individuals express motivation for specific factors such as gender balance, geographic distribution, career phase, and regional focus (in the case of Europe), the majority may not have explicitly mentioned these as key motivations. These results offer valuable insights into the research community's priorities and interests, informing future initiatives and research directions within the association.

Table 3 – Result of the association.

Topic	Motivation	
	YES	NO
<b>Gender Balance</b>	3	405
<b>Geographic Distribution (ITC or Non-ITC)</b>	3	405

<b>Career Phase (Young or Not Young)</b>	2	406
<b>North America</b>	0	408
<b>South America</b>	0	408
<b>Europe</b>	23	385
<b>Australia</b>	0	408
<b>Antarctica</b>	0	408
<b>Asia</b>	0	408
<b>Africa</b>	0	408

## SCIENTIFIC BACKGROUND ANALYSIS

Performing topic modeling, no words appear within the identified topics that invoke the three components of diversity: Gender Balance, Geographic Distribution (ITC or Non-ITC) and Career Phase (Young or Not Young).

Specifically, the 3 topics found mention:

- 1- Addressing Marine Pollution: Research on Plastic and Microplastics;
- 2- Studying Microplastics: Environmental Research and Project Work;
- 3- Exploring Organic Materials in Environmental Research.

Table 4 provides an overview of the topics discussed within the research community and the number of people involved in each topic. This table reflects the distribution of areas of interest and the community's enthusiasm regarding these topics.

**Studying Microplastics: Environmental Research and Project Work (Topic 2):** This topic attracts the participation of 184 individuals. The title suggests a strong focus on analyzing microplastics in the environmental context and undertaking related project work. The significant participation reflects the importance of microplastics analysis and associated research initiatives.

**Exploring Organic Materials in Environmental Research (Topic 3):** With 167 participants, this topic highlights the interest in research on the use of organic materials in the environmental context. This may include sustainable approaches to addressing environmental issues. The substantial participation indicates a strong engagement in this area of study.

**Addressing Marine Pollution: Research on Plastic and Microplastics (Topic 1):** This topic involves 57 participants and focuses on research related to marine pollution caused by plastics and microplastics. While the number of participants is lower compared to other topics, this research area remains paramount for understanding and mitigating marine pollution.

Table 4 - Number of scientific backgrounds assigned to each topic.

Topic N°	Title of the topic	N° of people
2	Studying Microplastics: Environmental Research and Project Work	184
3	Exploring Organic Materials in Environmental Research	167
1	Addressing Marine Pollution: Research on Plastic and Microplastics	57

To check more specifically whether someone in their scientific background mentioned some themes related to the three dimensions of the from verses studied, it was decided to apply an algorithm that includes the similarity of a text to specifically assigned themes:

Table 5 - Keywords selected for the application of the algorithm.

Topic	Words
<b>Gender Balance</b>	Gender, women, diversity, inclusivity, sex, equal, female, woman
<b>Geographic Distribution (ITC or Non-ITC)</b>	Developing countries, ethnicity, international

<b>Career Phase (Young or Not Young)</b>	Age, young, old, career, seniority, expert
<b>Asia</b>	Asia
<b>Africa</b>	Africa
<b>North America</b>	North America
<b>South America</b>	South America
<b>Antarctica</b>	Antarctica
<b>Europe</b>	Europe
<b>Australia</b>	Australia

70% as a similarity value was chosen as the threshold for attributing or not the Scientific Background to one of the three identified areas.

Table 6 provides a snapshot of the scientific background within the research community, specifically in terms of gender balance, geographic distribution, career phase, and regional focus.

**Gender Balance and Scientific Background:** Nine individuals have considered gender balance in their scientific background, while 399 have not explicitly mentioned it. This suggests that, for the majority, gender balance may not be a central aspect of their scientific background.

**Geographic Distribution and Scientific Background:** Concerning geographic distribution (ITC or non-ITC countries), one individual has incorporated it into their scientific background, whereas 407 have not, indicating that geographic distribution may not be a primary consideration in the scientific background.

**Career Phase and Scientific Background:** Eleven individuals have acknowledged career phase (Young or Not Young) in their scientific background. At the same time, 397 have not, suggesting that career phase may not be a predominant factor in the scientific background of most community members.

**Regional Focus and Scientific Background:** The table also highlights motivations for research related to Antarctica and Asia, with one individual expressing motivation for each region. In other regions (North America, South America, Europe, Australia, and Africa), no individuals have explicitly mentioned motivation for a regional focus in their scientific background.

Table 6 - Result of the association.

Topic	Scientific Background	
	YES	NO
<b>Gender Balance</b>	9	399
<b>Geographic Distribution (ITC or Non-ITC)</b>	1	407
<b>Career Phase (Young or Not Young)</b>	11	397
<b>North America</b>	0	408
<b>South America</b>	0	408
<b>Europe</b>	9	399
<b>Australia</b>	0	408
<b>Antarctica</b>	1	407
<b>Asia</b>	1	407

Africa	0	408
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## CONTRIBUTION ANALYSIS

In order to check more specifically whether someone in their contribution mentioned some themes related to the three dimensions of the from verses studied, it was decided to apply an algorithm that includes the similarity of a text to specifically assigned themes:

- 1- Microplastics in the Environment: Contributions and Research;
- 2- Group Dynamics and Contributions in Plastic Research Activities;
- 3- Contributions and Discussions in Scientific Plastic Research;
- 4- Experiments and Analysis: Understanding Plastic Types and Function;
- 5- Quantifying Plastic Leakage: Challenges and Solutions;
- 6- Micro and Nano Plastic Presence in Water and Soil;
- 7- Revolutionizing Plastic Detection: Sensor Innovations;
- 8- Shelf Life and Packaging Innovations: Environmental Improvements.

Table 7 presents an overview of the contributions made within the research community, categorized by different topics. It provides insight into the distribution of efforts and participation across various research areas and the number of individuals involved in each topic.

**Microplastics in the Environment: Contributions and Research (Topic 1):** This topic demonstrates significant engagement, involving 299 individuals. It suggests a strong focus on understanding microplastics' presence and impact in the environment. The substantial participation underscores the importance of research in this area.

**Group Dynamics and Contributions in Plastic Research Activities (Topic 2):** With 86 participants, this topic delves into the dynamics of group collaboration and contributions in plastic research activities. It reflects the significance of collaborative efforts within the research community.

**Contributions and Discussions in Scientific Plastic Research (Topic 3):** While involving 13 individuals, this topic centers on contributions and discussions in scientific plastic research. It likely represents more specialized and in-depth discussions within the community.

**Experiments and Analysis: Understanding Plastic Types and Function (Topic 4):** This topic, with four participants, highlights research focused on experiments and analysis to understand plastic types and their functions. Although smaller in terms of participants, it emphasizes the importance of detailed experimentation.

**Revolutionizing Plastic Detection: Sensor Innovations (Topic 7):** With three participants, this topic focuses on innovative approaches to plastic detection, particularly through sensor innovations. It represents a niche area of research with specialized interest.

**Micro and Nano Plastic Presence in Water and Soil (Topic 6):** This topic also has three participants and deals with the presence of micro and nano plastics in water and soil. It showcases the research community's commitment to understanding the environmental impact of these small plastic particles.

Table 7 - Number of contributions assigned to each topic.

Topic N°	Title of the topic	N° of people
1	Microplastics in the Environment: Contributions and Research	299
2	Group Dynamics and Contributions in Plastic Research Activities	86
3	Contributions and Discussions in Scientific Plastic Research	13
4	Experiments and Analysis: Understanding Plastic Types and Function	4
7	Revolutionizing Plastic Detection: Sensor Innovations	3
6	Micro and Nano Plastic Presence in Water and Soil	3

To check more specifically whether someone in their Contribution mentioned some themes related to the three dimensions of the from verses studied, it was decided to apply an algorithm that includes the similarity of a text to specifically assigned themes:

Table 8 - Keywords selected for the application of the algorithm.

Topic	Words
<b>Gender Balance</b>	Gender, women, diversity, inclusivity, sex, equal, female, woman
<b>Geographic Distribution (ITC or Non-ITC)</b>	Developing countries, ethnicity, International
<b>Career Phase (Young or Not Young)</b>	Age, young, old, career, seniority, expert
<b>Asia</b>	Asia
<b>Africa</b>	Africa
<b>North America</b>	North America
<b>South America</b>	South America
<b>Antarctica</b>	Antarctica
<b>Europe</b>	Europe
<b>Australia</b>	Australia

70% as the similarity value was chosen as the threshold for attributing or not attributing Contribution to one of the three identified areas.

Table 8 outlines the results of the association, focusing on contributions to various aspects of research, including gender balance, geographic distribution, career phase, and regional focus.

**Gender Balance and Contribution:** Ten individuals have expressed a commitment to contribute to gender balance within the research community, while 398 individuals have not explicitly mentioned it. This suggests that while there is motivation for gender balance, it may not be universally integrated into contributions.

**Geographic Distribution and Contribution:** Two individuals have expressed motivation for contributing to this aspect for the geographic distribution factor (ITC or non-ITC countries), while 406 have not. This indicates that geographic distribution may not be a primary focus in the contributions made by the majority of the community.

**Career Phase and Contribution:** Regarding career phase (Young or Not Young), only one individual has explicitly expressed a commitment to consider it in their contributions, while 407 individuals have not. This suggests that career phase might not be a central consideration for most community members in their contributions.

**Regional Focus and Contribution:** The table also provides insights into regional focus, with contributions motivated for South America, Antarctica, Asia, and Europe, but none for North America, Australia, or Africa. This signifies a more varied engagement with regional focus, with several regions being addressed in the contributions.

Table 9 - Result of the association.

Topic	Contribution	
	YES	NO
Gender Balance	10	398
Geographic Distribution (ITC or Non-ITC)	2	406
Career Phase (Young or Not Young)	1	407
North America	0	408
South America	1	407
Europe	6	402
Australia	0	408
Antarctica	1	407
Asia	3	405
Africa	0	408

## ABSTRACT ANALYSIS

To understand whether an author joins a specific working group to contribute in terms of expertise and knowledge or whether to acquire it, we have assessed with a specific algorithm when their production of scientific articles comes close to the topics covered by the working groups. To do this, the abstracts were analyzed by comparing them with some key words that can be traced back to the descriptions of the individual working groups. The results of this analysis are shown in the Table 10.

**Impacts and risks on human health and environment:** This theme is associated with the working group WG1, which focuses on assessing impacts and risks related to Nanoplastics and Microplastics on human health and the environment. This theme is very typical with a 50.43% of similarity among participants in this group.

**Monitoring and sampling:** Working group WG2 is dedicated to the monitoring and sampling of Microplastics. This theme is not very typical with a 27.40% of similarity among participants in this group.

**Instrumentation, modeling, data evaluation, software, and analytical procedures:** This theme is linked to WG3, which focuses on instrumentation, modeling, data evaluation, and analytical procedures related to Nanoplastics and Microplastics. This theme is very typical with a 41.39% of similarity among participants in this group.

**Detection and quantification:** WG4 focuses on Nanoplastics, this theme is not very typical with a 34.99% of similarity among participants in this group.

**Remediation, recovery and development of sustainable alternatives:** WG5 addresses issues related to remediation, recovery, and the development of sustainable alternatives to plastic materials. This theme is not very typical with a 33.41% of similarity among participants in this group.

**Metrology and standardization:** WG6 is dedicated to metrology and standardization.

This theme is not very typical with a 30.95% among participants in this group.

**Develop new strategies to increase synergies with society and education:** This theme is associated with WG7, which aims to develop new strategies to increase synergies between scientific research on Nanoplastics and Microplastics, society, and education. This theme is not very typical with a 29.76% of similarity among participants in this group.

**Gender diversity:** This is another general theme related to promoting gender diversity within scientific research. It is not associated with a specific working group.

The group in which the most people with expertise and knowledge relevant to the topic participate is WG1. In contrast, for the others the % remains low so most likely the pull of participants is heterogeneous in terms of expertise and knowledge.

The topic of gender diversity is little discussed.

Table 10 - Keywords and results of the abstract analysis.

Words used to identify the theme	Working group	Average of all participants	Average of the participants in the corresponding working groups
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Impacts and risks on human health and environment	WG1 - Impacts and risks on human health and environment related to Nano- and Microplastic	0.50193442	0.504370202
Monitoring and sampling, water, soil, sludges, sediments, biological samples, air, food	WG2 - Monitoring and sampling Microplastics	0.27303378	0.274066025
Instrumentation, modelling, data evaluation, software, and analytical procedures, Microscopy, Spectroscopy, Pyrolysis, Gas chromatography-mass spectrometry	WG3 - Instrumentation, modelling, data evaluation, software, and analytical procedures	0.4092358	0.413920225
Detection and quantification, reliability, hazard data, toxicity	WG4 - Nanoplastics	0.36338405	0.349937772
Remediation, recovery and development of sustainable alternative, Mitigation approaches, Detection, Analytical tools	WG5 - Remediation, recovery and development of sustainable alternative to plastic materials	0.34382748	0.33419181
Metrology and standardization, validation protocols, data comparable	WG6 - Metrology and standardization	0.30809216	0.309551377
Develop new strategies to increase the synergies with society and education, Science communication group, Citizen science, Boardgames for educative purposes	WG7 - Develop new strategies to increase the synergies with society and education	0.3037115	0.29767081
Gender diversity female woman women	General topic	0.29209805	

## NETWORK ANALYSIS

To check the effects of COST from the perspective of networking, joint publications between 1 or more authors of individual Working groups were analyzed.

### WG1 - IMPACTS AND RISKS ON HUMAN HEALTH AND ENVIRONMENT RELATED TO N/MPs

Figure 19 represents the number of articles published within specific years. Starting from 1996, the number of articles was relatively low, but there was a steady increase up to 2001, with a peak of 4 articles. After 2001, there was a noticeable decline, with many years where very few or even no articles were published, such as in 1998 and 2004. However, from 2005 onwards, the number of articles began to grow again and showed fluctuating trends until 2010 when there was a significant

increase to 12 articles. From 2010 onwards, there was a further steady increase in the number of articles published, with peaks in 2018, 2019, 2021, and 2022. In 2023, there appears to be a decrease compared to the previous year, but the number of 34 articles is still relatively high.

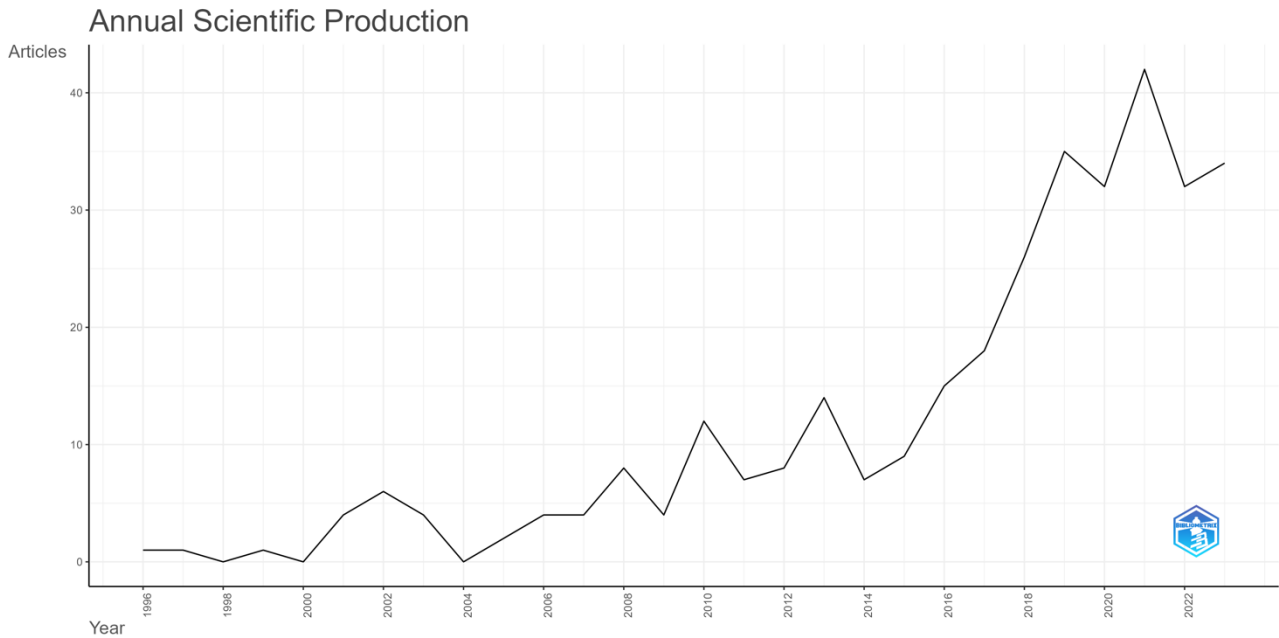


Figure 19 - Number of publications over the time

As can be seen from Figure 20 among the 50 most frequently used words in the authors' abstracts, no words related to the topic of diversity appear especially in the three directions studied by the DEI Group.

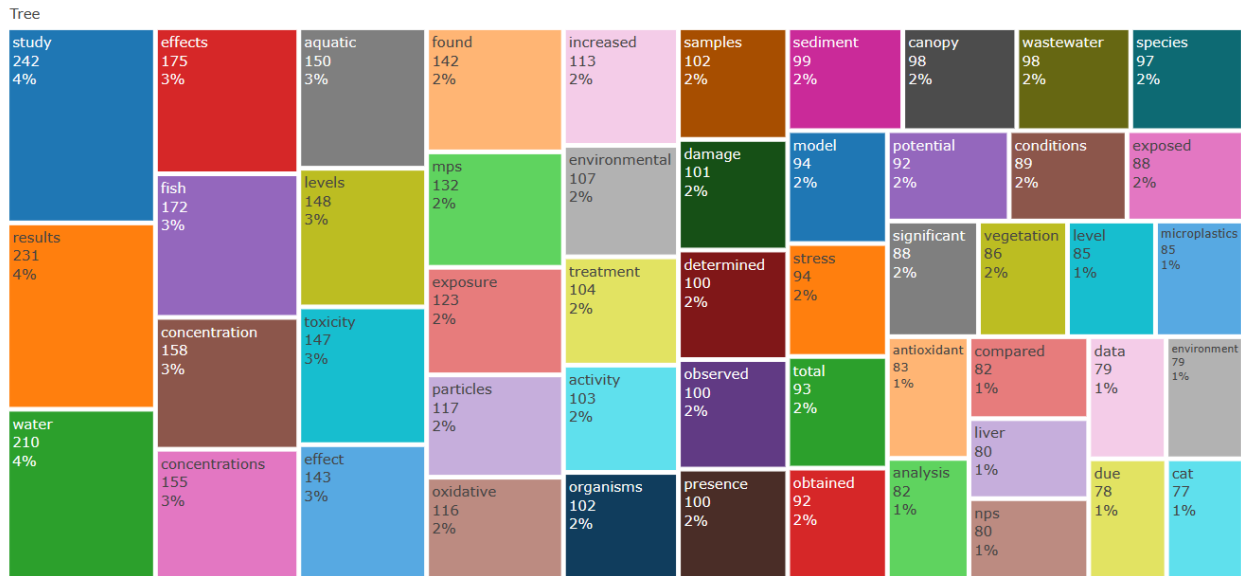


Figure 20 - Most 50-word used in abstract

By making the map linking the COST authors who have done work together before and after the advent of COST itself, it can be seen that new connections have developed, such as, for example, that between Canada and the USA (Figure 21-22). What is most noticeable is the concentration of connections in the European area and that other parts of the world are mostly connected with Europe. Underdeveloped countries tend to connect to developed countries.

### Country Collaboration Map



Figure 21 - Map before COST

### Country Collaboration Map



Figure 22 - Map after COST

## WG2 - MONITORING AND SAMPLING MICROPLASTICS

Figure 23 represents the number of articles published within specific years. Starting from 2003, the number of articles was relatively low, but there was a steady increase up to 2011, with a peak of 16

articles. However, from 2015 onwards, the number of articles grew again and showed fluctuating trends until 2021.

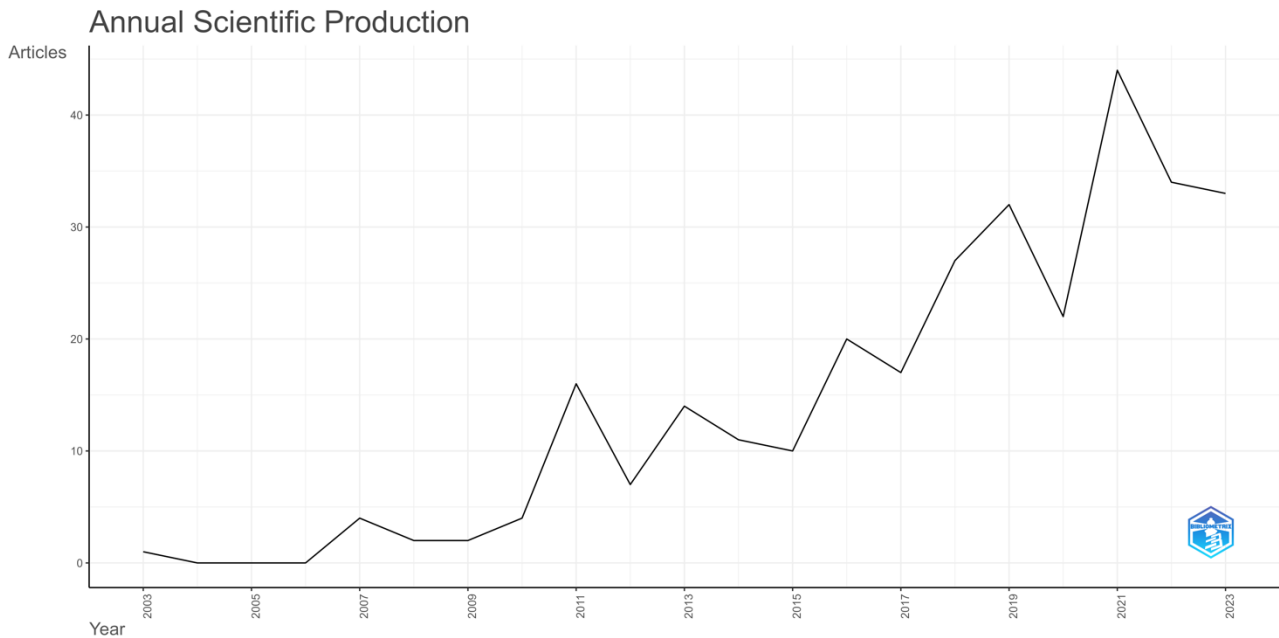


Figure 23 - Number of publications over the time

As shown in Figure 24, among the 50 most frequently used words in the authors' abstracts, no words related to the topic of diversity appear especially in the three directions studied by the DEI Group.

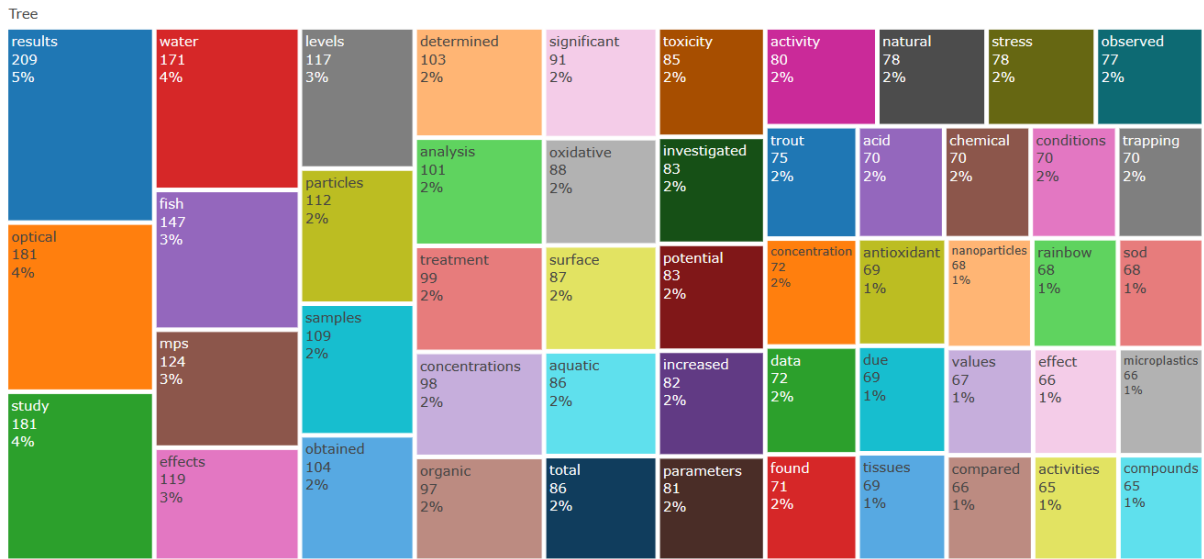


Figure 24 - Most 50-word used in abstract

By making the map connecting COST authors who worked together before and after the advent of COST itself, one can see that many new connections have developed (Figure 25-26). Most noticeable is the concentration of connections in the European area and that other parts of the world are mostly connected to Europe. Underdeveloped countries tend to connect to developed countries.

### Country Collaboration Map

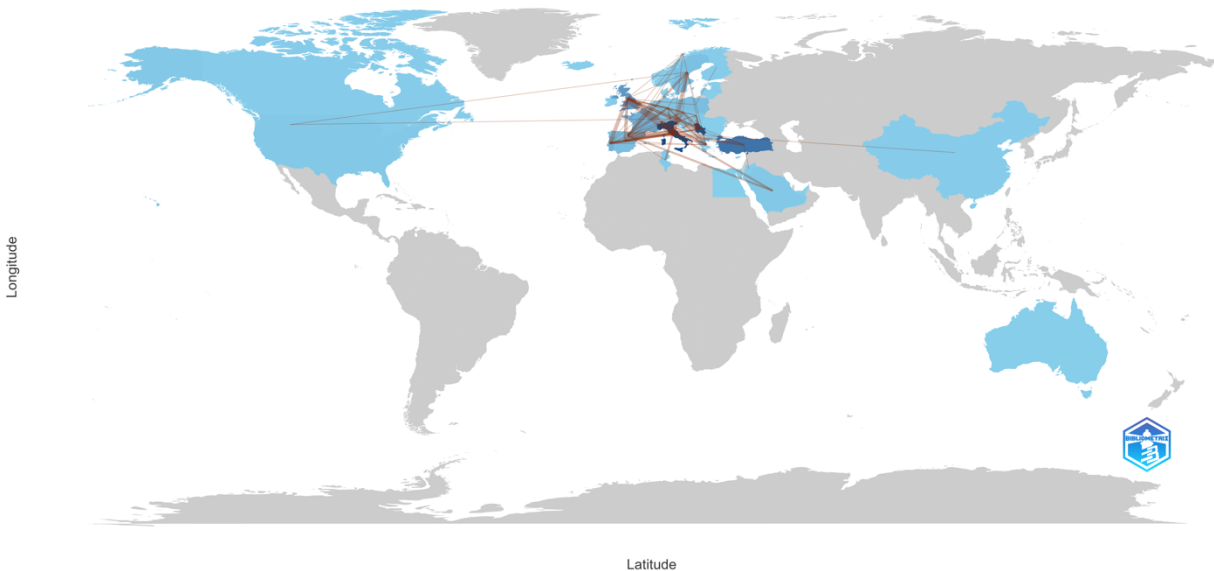


Figure 25 - Map before COST

## Country Collaboration Map

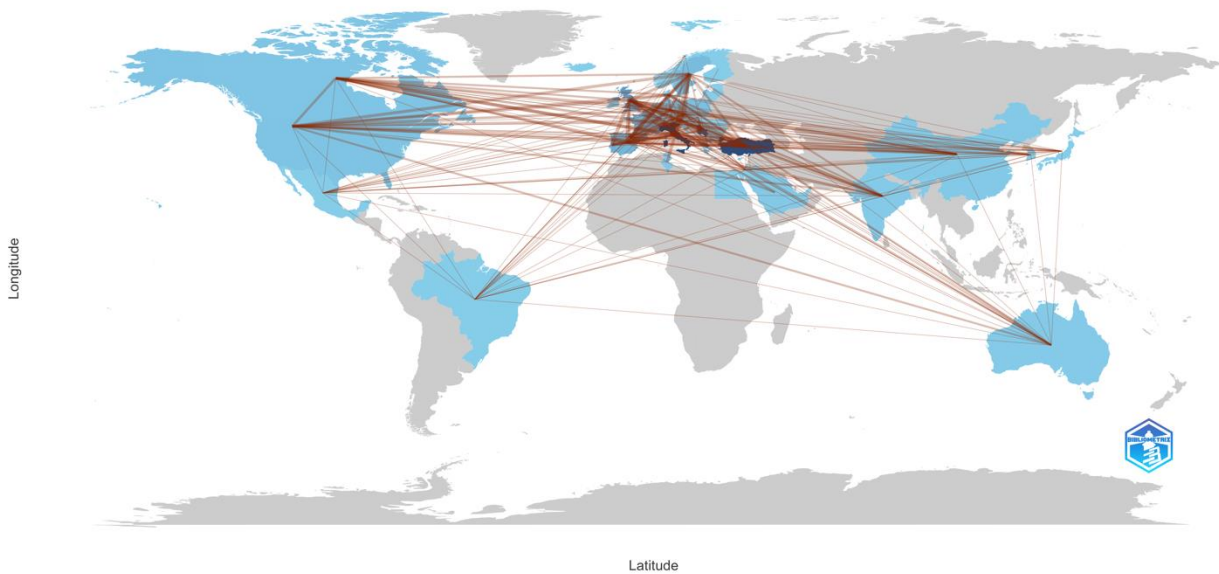


Figure 26 - Map after COST

### WG3 – INSTRUMENTATION, MODELLING, DATA EVALUATION, SOFTWARE, AND ANALYTICAL PROCEDURES

Figure 27 represents the number of articles published within specific years. Starting from 2003, the number of articles was relatively low, but there was a steady increase up to 2011, with a peak of 16 articles. However, from 2015 onwards, the number of articles grew again and showed fluctuating trends until 2021.

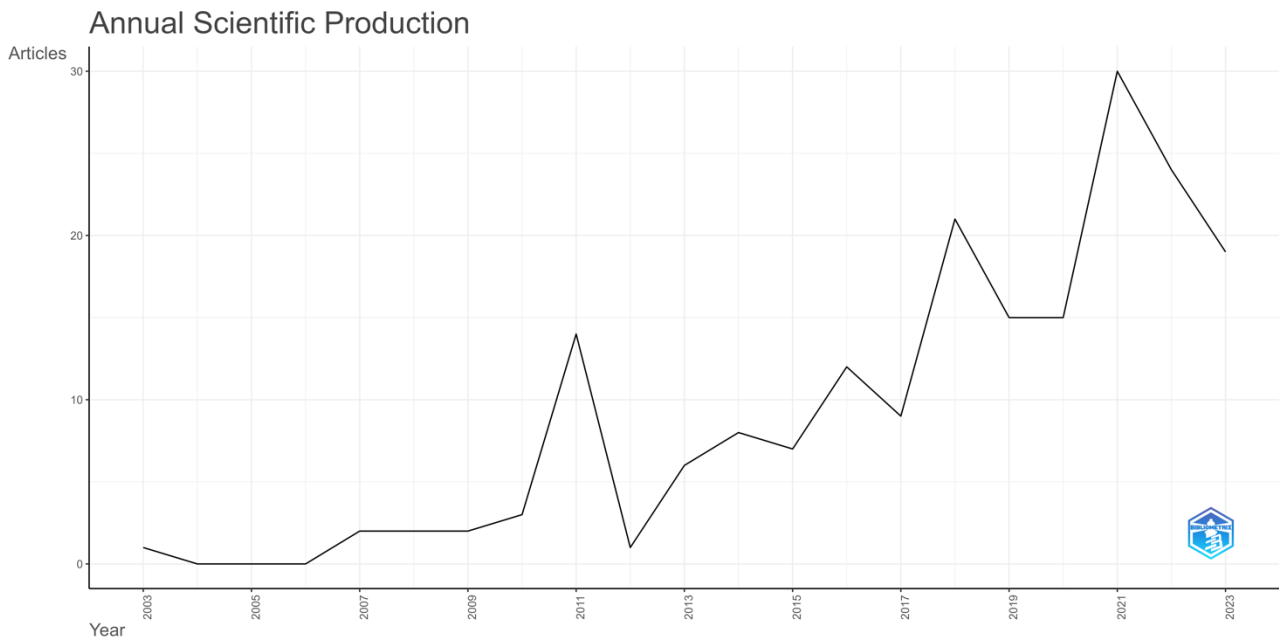


Figure 27 - Number of publications over the time

As can be seen from Figure 28 among the 50 most frequently used words in the authors' abstracts, no words related to the topic of diversity appear especially in the three directions studied by the DEI Group.

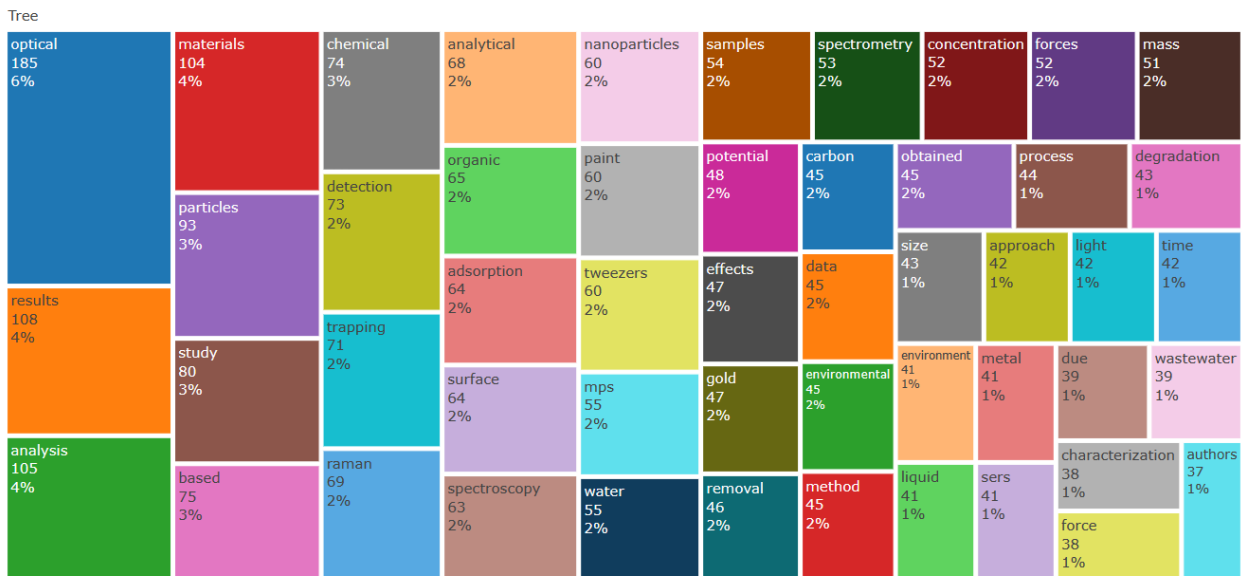


Figure 28 - Most 50-word used in abstract

By making the map connecting COST authors who worked together before and after the advent of COST itself, one can see that many new connections have developed (Figure 29-30). Most noticeable is the concentration of connections in the European area and that other parts of the world are mostly connected to Europe. Underdeveloped countries connect to developed countries.

### Country Collaboration Map

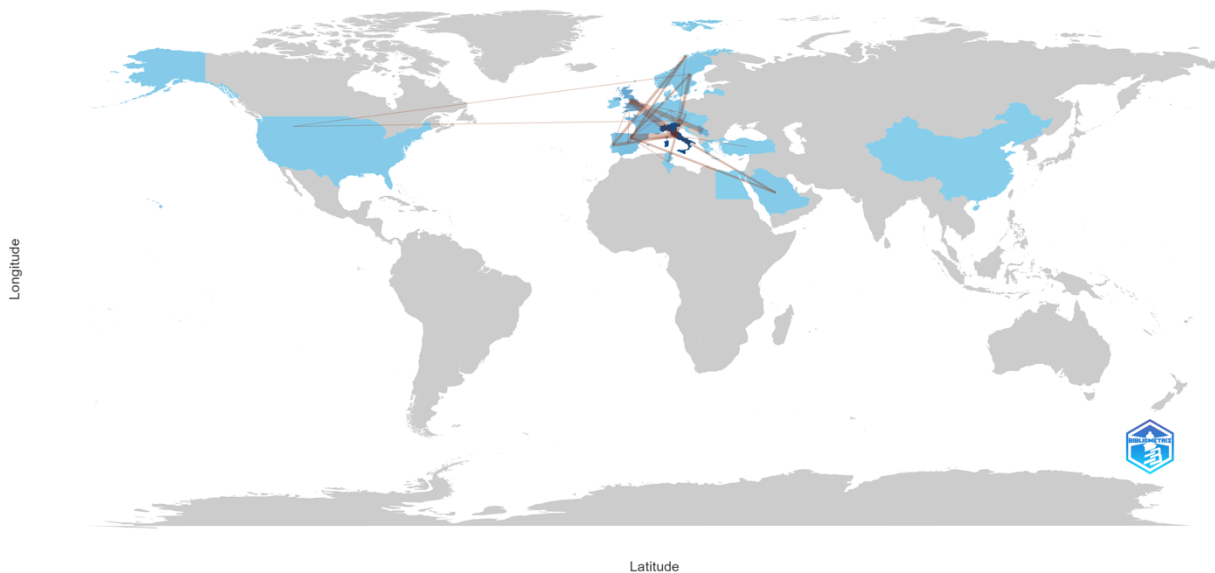


Figure 29 - Map before COST

### Country Collaboration Map



Figure 30 - Map after COST

#### WG4 - NANOPLASTICS

Figure 31 represents the number of articles published within specific years. Starting from 2003, the number of articles was relatively low, but there was a steady increase up to 2011, with a peak of 16 articles. However, from 2015 onwards, the number of articles grew again and showed fluctuating trends until 2021.

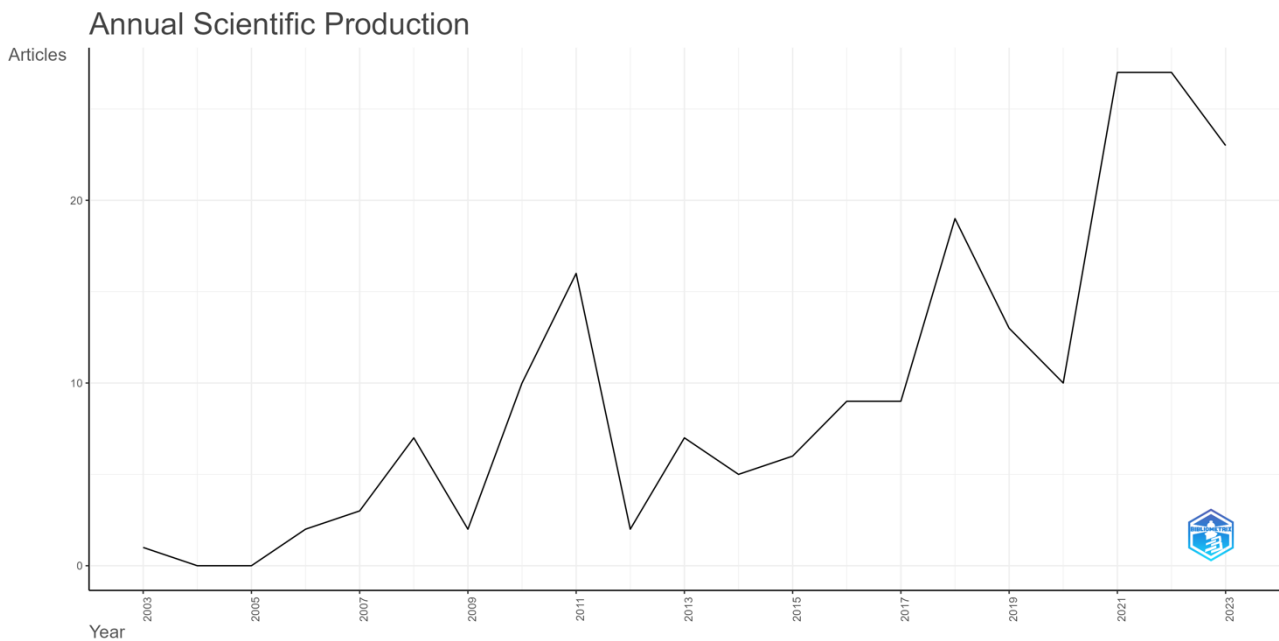


Figure 31 - Number of publications over the time

As can be seen from Figure 32 among the 50 most frequently used words in the authors' abstracts, no words related to the topic of diversity appear especially in the three directions studied by the DEI Group.

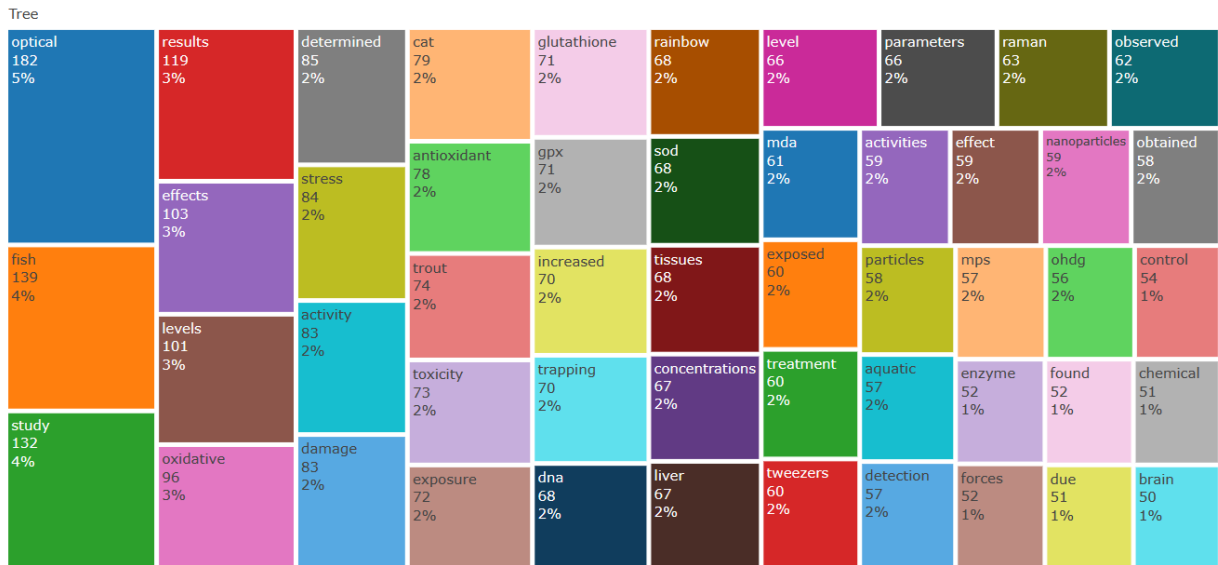


Figure 32 - Most 50-word used in abstract

By making the map connecting COST authors who worked together before and after the advent of COST itself, one can see that many new connections have developed (Figure 33-34). Most noticeable is the concentration of connections in the European area and that other parts of the world are mostly connected to Europe. Underdeveloped countries tend to connect to developed countries.

### Country Collaboration Map



Figure 33 - Map before COST

### Country Collaboration Map

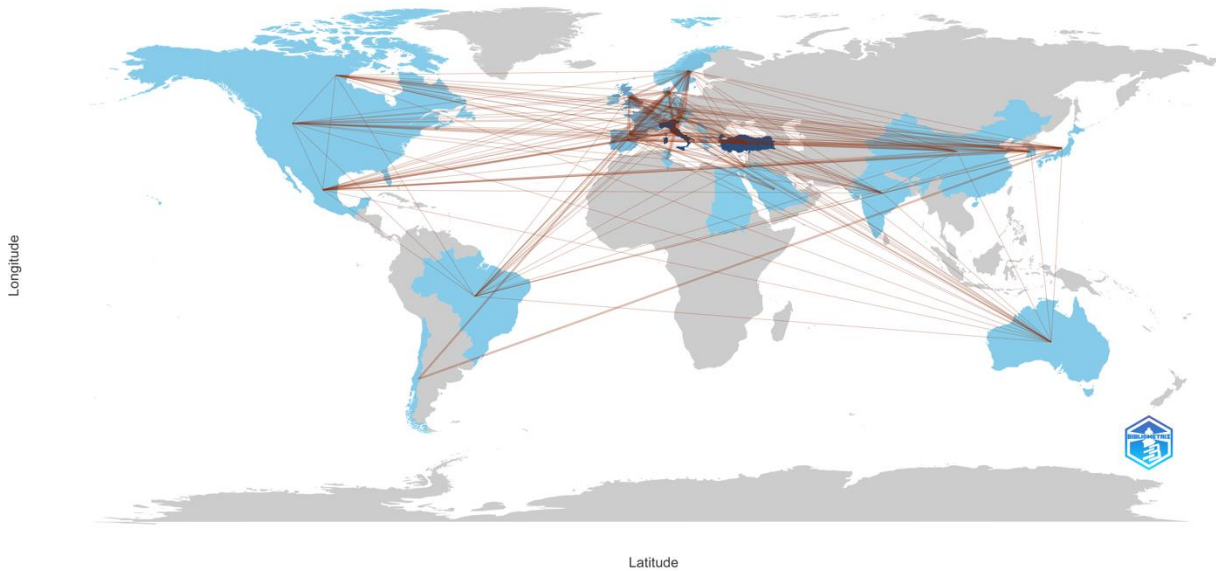


Figure 34 - Map after COST

### WG5 - REMEDIATION, RECOVERY AND DEVELOPMENT OF SUSTAINABLE ALTERNATIVE TO PLASTIC MATERIALS

Figure 35 represents the number of articles published within specific years. Starting from 2005, the number of articles was relatively low, but there was a steady increase up to 2015, with a peak of 15 articles. However, from 2015 onwards, the number of articles grew again and showed fluctuating trends until 2021.

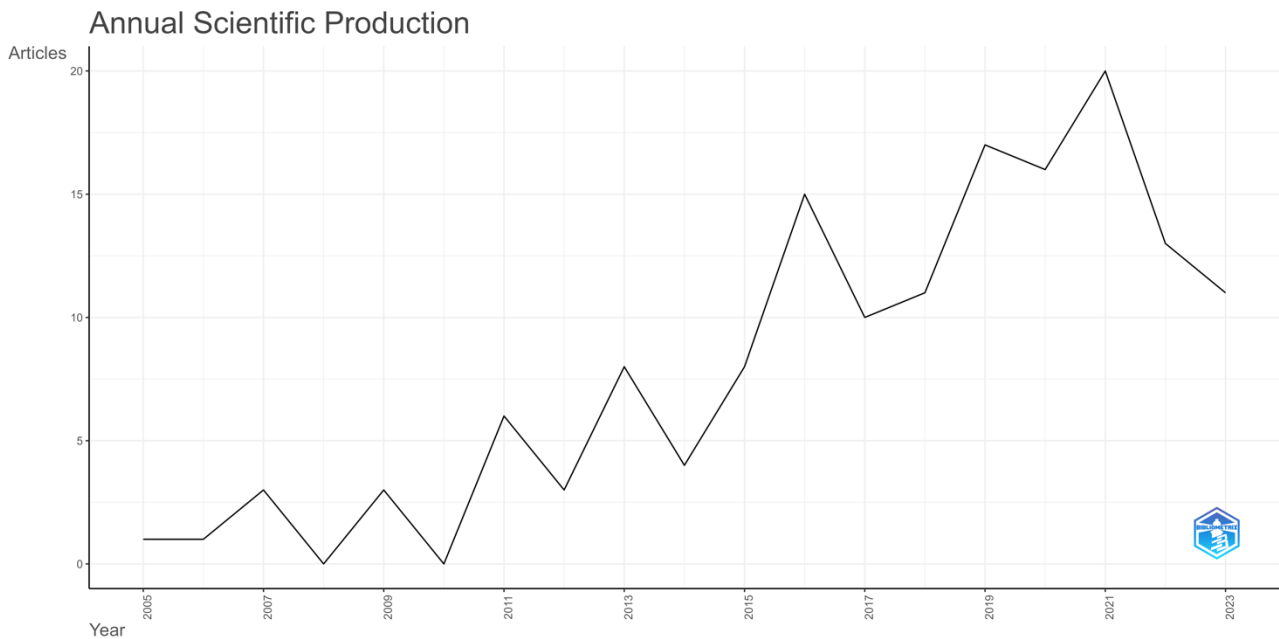


Figure 35 - Number of publications over the time

As can be seen from Figure 36 among the 50 most frequently used words in the authors' abstracts, no words related to the topic of diversity appear especially in the three directions studied by the DEI Group.

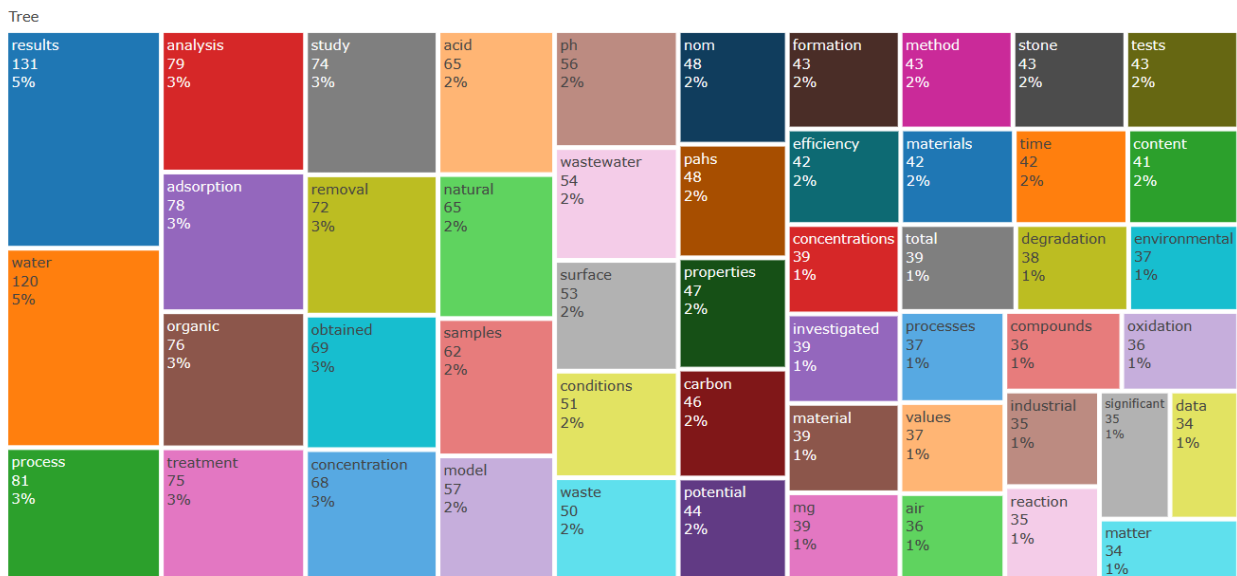


Figure 36 - Most 50-word used in abstract

By making the map connecting COST authors who worked together before and after the advent of COST itself (Figure 37-38). Most noticeable is the concentration of connections in the European area and that other parts of the world are mostly connected to Europe. The underdeveloped countries in this case are not connected to anyone. In general few states are active on this thematic area, and since the beginning of COST the network has not developed much.

### Country Collaboration Map

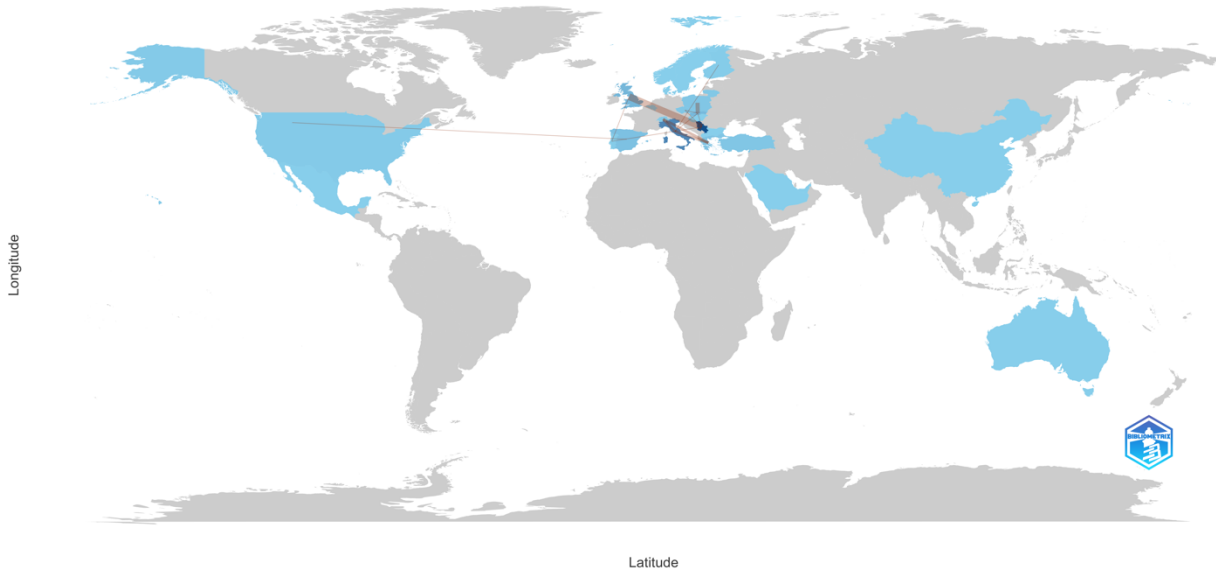


Figure 37 - Map before COST

### Country Collaboration Map

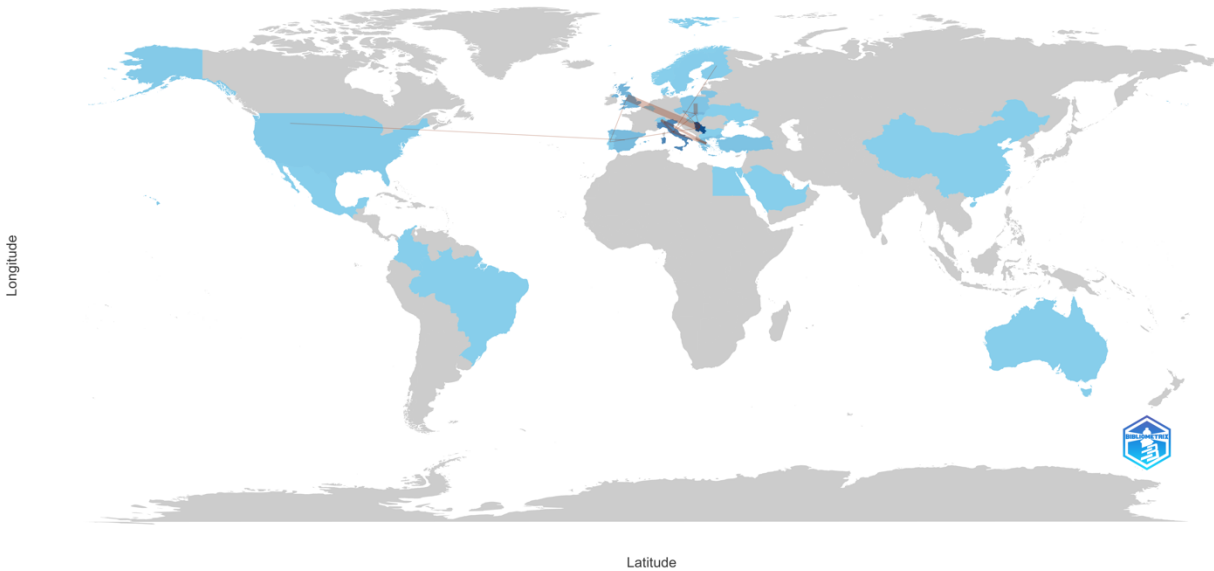


Figure 38 - Map after COST

### WG6 - METROLOGY AND STANDARDIZATION

Figure 39 represents the number of articles published over a range of years. Between 2004 and 2006, the number of articles remained relatively low, with a minimum of zero articles in 2004. Starting from 2007, there was a significant growth in the number of articles published. This increase continued until 2011, with a peak of 14 articles. After the 2011 peak, the number of articles remained significantly higher than previous years, although it showed some fluctuations. Between 2018 and 2021, there was a substantial increase, with the number of articles more than doubling, reaching a peak of 22 articles in 2021. Although the number of articles decreased slightly in 2022 and 2023, it still remains relatively high compared to previous years.

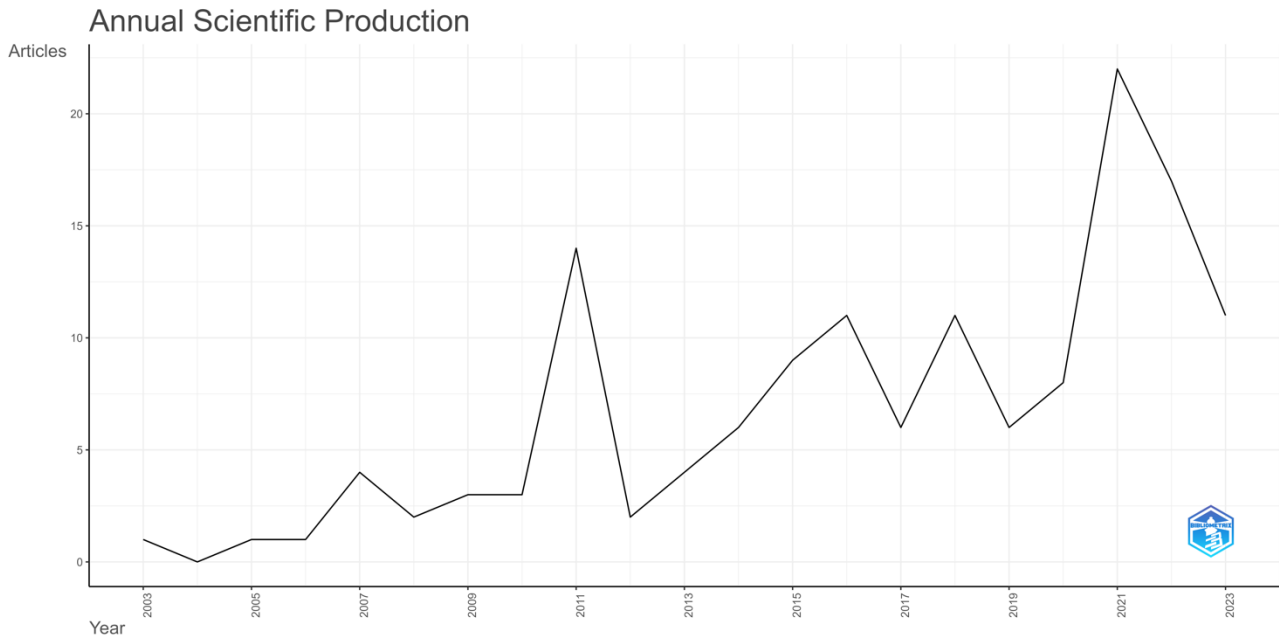


Figure 39 - Number of publications over the time

As can be seen from Figure 40 among the 50 most frequently used words in the authors' abstracts, no words related to the topic of diversity appear especially in the three directions studied by the DEI Group.

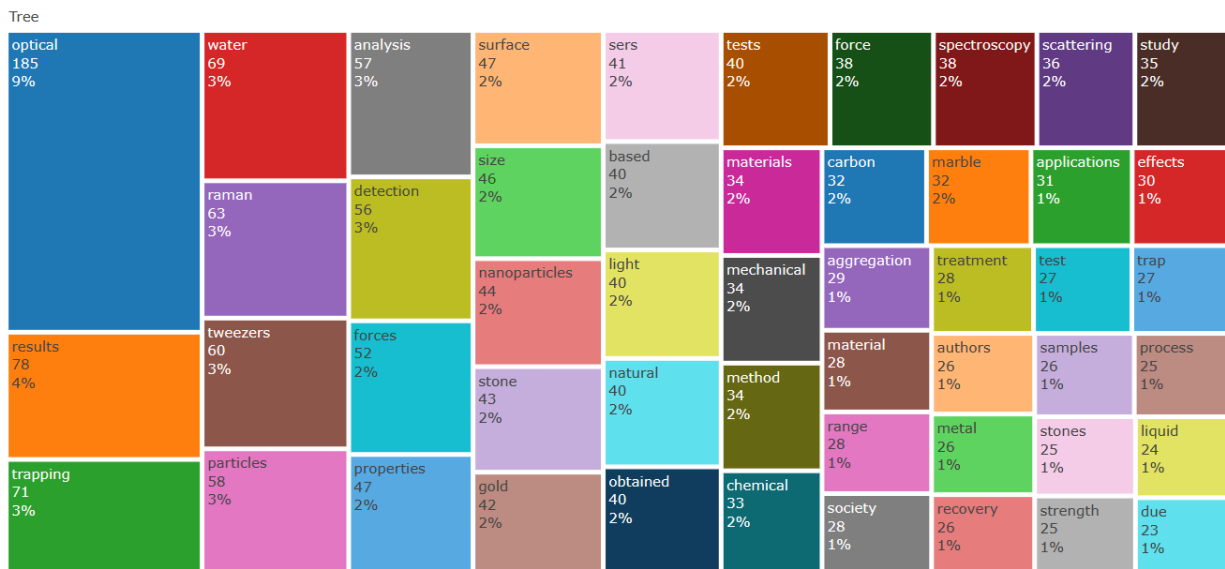


Figure 40 - Most 50-word used in abstract

By making the map connecting COST authors who worked together before and after the advent of COST itself, one can see that many new connections have developed (Figure 33-34). Most noticeable is the concentration of connections in the European area and that other parts of the world are mostly connected to Europe. Underdeveloped countries tend to connect to developed countries.

### Country Collaboration Map



Figure 41 - Map before COST

### Country Collaboration Map



Figure 42 - Map after COST

#### WG7 - DEVELOP NEW STRATEGIES TO INCREASE THE SYNERGIES WITH SOCIETY AND EDUCATION

Figure 43 represents the number of articles published within specific years. Starting from 2006, the number of articles was relatively low, but there was a steady increase up to 2015, with a peak of 4 articles. However, from 2015 onwards, the number of articles grew again and showed fluctuating trends until 2021.

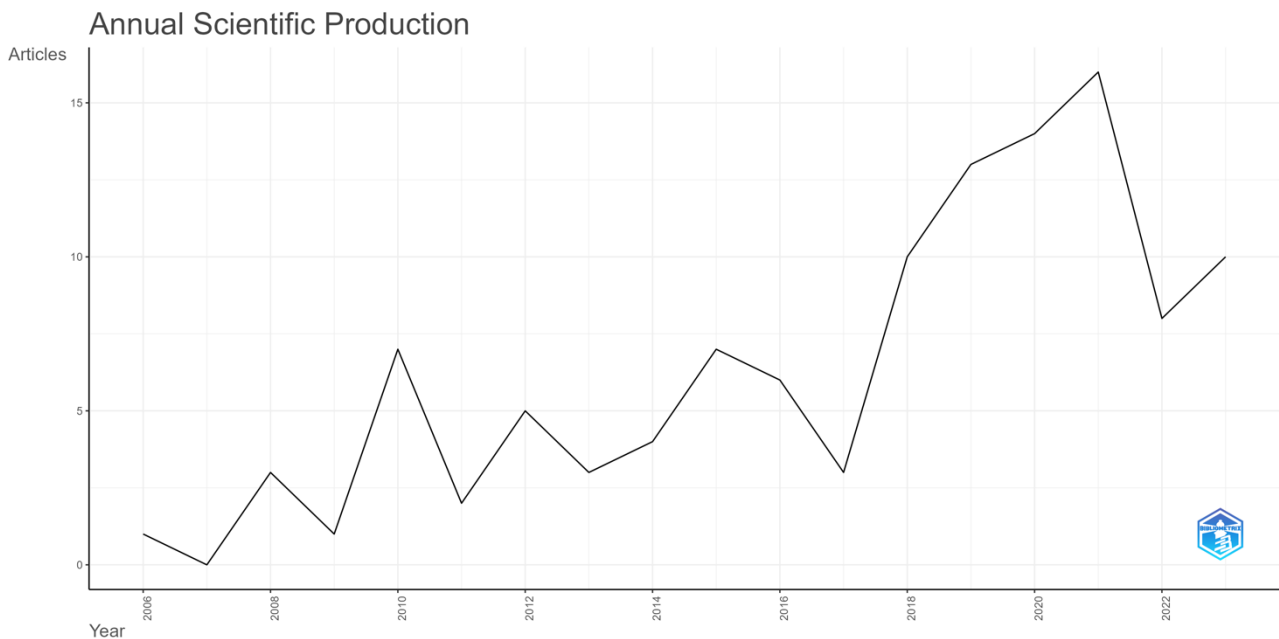


Figure 43 - Number of publications over the time



### Country Collaboration Map

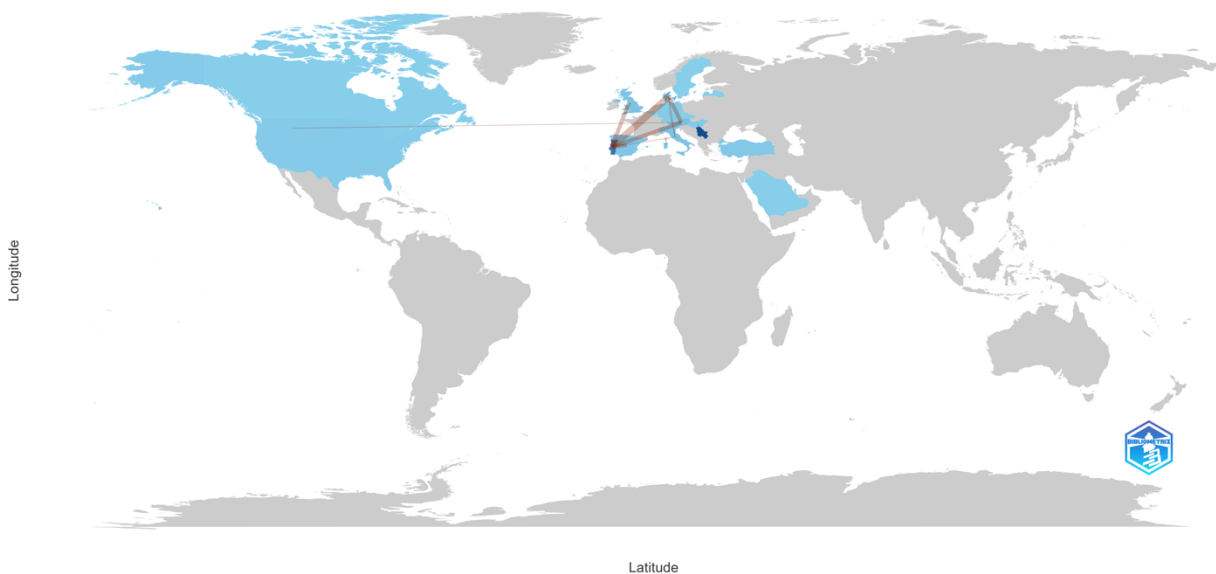


Figure 45 - Map before COST

### Country Collaboration Map

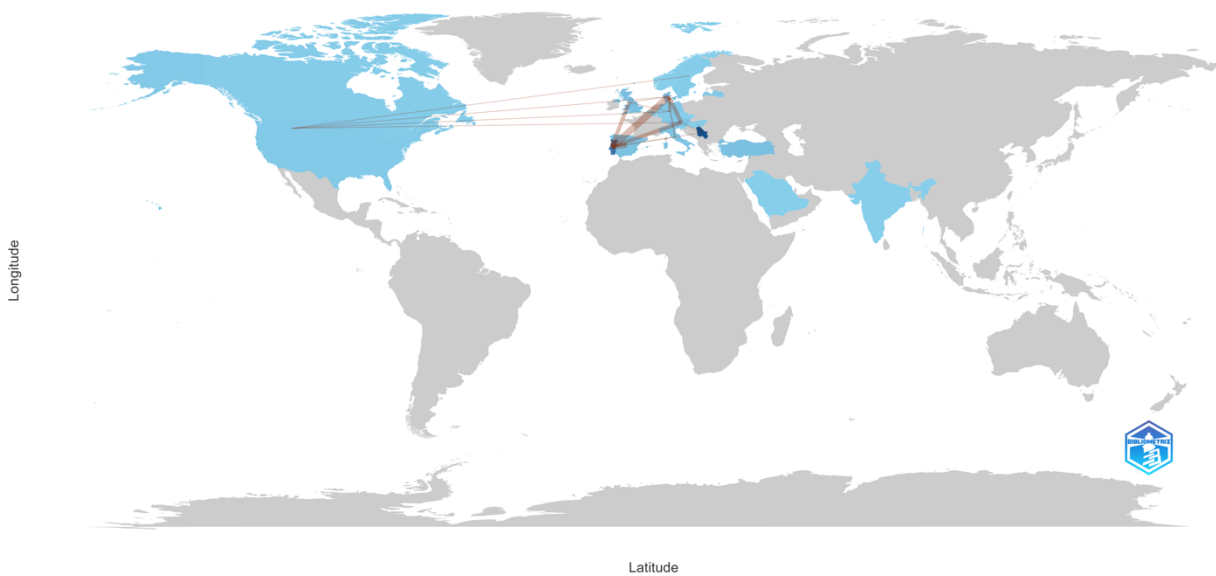


Figure 46 - Map after COST

## CONCLUSION

From the analysis, it emerges that within the members of the COST the two directions of diversity that cause the most concern are those linked to the career stage and belonging to an ITC country. As regards the gender component, there is a majority of women compared to men and the majority of COST participants belong to the Not Young category.

Some strategies should be developed to involve women and young researchers and make them understand the importance of a large part of a network. In particular, non-male ITCs should take charge of young ITCs. It's important to acknowledge the relatively high number (68 individuals) of senior members who are both non-ITC and male, which can be considered a privileged category. To address this, proactive measures could involve implementing mentorship programs aimed at benefiting the less privileged categories within the group. Encouragingly, many members actively engage with their women counterparts to avoid the formation of exclusive gender-centric cliques, fostering an environment of equal opportunity and collaboration. In the future, it would be interesting to know the academic level achieved (e.g., PhD, researcher, associate professor, full professor).

The data regarding the number of publications, citations and the H-Index underscores a longstanding and confirmed issue: women are not included in influential networks, and men tend to cite other men, perpetuating a negative feedback loop. This pattern repeats also for ITC, resulting in them being cited less and remaining on the outskirts of the research network. This reflects an issue of intersectionality that is compounded: women and ITC countries (excluding young members) face reduced recognition and citations, contributing to persistent disparities and limited participation in crucial research domains.

As regards distribution at a geographical level, most of the members belong to nations on the European continent. There are few members from other continents. Therefore in the future, we should think about methods to promote diffusion in other continents too, by exploiting co-authorship relationships already present among the authors, which could involve those who are not members of COST.

From the analysis of the contributions, scientific backgrounds, and Motivations, it emerges that most COST participants do not include references to the three identified diversity directions. The absence of motivations linked to certain aspects represents a double challenge: on the one hand, those who finance the activities do not consider the lack of specific dimensions; on the other hand, those who participate do not consider these aspects in their motivations. This creates a paradox: if these dimensions became mandatory, the number of participants would be significantly reduced, with only around thirty participants.

Analyzing the contents of the abstracts we notice that the group in which the most people with expertise and knowledge relevant to the topic participate is WG1. In contrast, for the others the % remains low so most likely the pull of participants is heterogeneous in terms of expertise and knowledge. The topic of gender diversity is little discussed.

Analyzing the networks, I found that in some working groups the network has grown significantly (e.g. WG4 or WG3), while in other groups it has not (e.g. WG7 or WG5).

This growth may not be due to COST.

It is important to note that some geographical areas are affected in which there are no COST members who could, therefore, be involved to expand the COST membership.

Strategies should be found to encourage the creation of networks to benefit members of ITC countries and the most disadvantaged categories. Mentorship programs between researchers from different countries could be helpful.

