SUPER MORRI Case Study Narrative Gendered Eco-Innovation Narrative of the Spanish and German Interviews

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1 Introduction and study design

Overall, the case study on gendered eco-innovations has two parts, a quantitative patent analysis that examines the patterns of green innovation and the participation of female inventors hereby on the one hand (pattern study). In addition, a qualitative, interview-based part aims to trace the causes of the relationship between gender and eco-innovation on the other hand (pathway study). In particular, this pathway study aims to understand if and how gender diversity and equality effects are manifested in eco-innovations.

The narrative presented here is largely based on the qualitative part and follows the three guiding questions set by the WP5 coordinators:

1. How and to what extent does having more women inventors make a difference in green patents and innovations?
2. Where do you see the opportunities and shortcomings through the lens of gender in green tech?
3. What does your case teach us about responsibility in research and innovation as it relates to gender in sustainable innovation?

The starting point for our case study was a comprehensive literature analysis that showed a relationship between gender diversity and eco-innovations (see below). Also, a quantitative exploration in a green patents database held at INGENIO showed an effect on women within diverse teams to produce more green innovations.

However, there are major unknowns about these phenomena, thus far mainly approached in a quantitative way that shows the pattern. Here, we are contributing to disentangling the pathway, as the crucial research gap is to understand which kind of diversity is translated into the innovation process and the underlying mechanisms to generate the observed link between gender diversity and equality and eco-innovations. Women's participation in innovation is, however, very scarce, so possible inequality and barriers and how organizations deal with them are key points in the study.

Our initial level of analysis was companies in Spain and Germany and involved the inventors and other members of the firm. We were also interested in exploring how the different stages and maturity of eco-innovations relate to gender. However, the firms did not collaborate with the study and their participation in the early stages of innovation too, so we finally focused on the inventors' perceptions. The inventors have been identified through the Green Technologies Database based on PATSTAT and through snowballing, as it will be explained in the methodological section.

The relevance of this work is derived from the fact that either "The Green Economy" as well as promoting Gender Equality (GE) is at the top of the EU agenda (see "A Union of Equality: Gender Equality Strategy 2020-2025"). In our view, eco-innovations reflect corporate responsibility towards the environment and a sustainable future.

To summarize, this case study aims to investigate whether gender diversity positively influences the emergence of eco-innovations (a descriptive question that identifies a pattern) and how the underlying mechanisms can be described (an analytical question that

aims to identify pathways). Finally, our guiding question in contributing to the SuperMorri project is the following: Is gender diversity a proxy indicator for openness towards societal needs and anticipatory, reflective, responsive and inclusive innovation behaviour? Knowing more about those aspects helps us to reflect on monitoring the gender key and others.

Our results point to the fact that there is a link between gender diversity and openness towards societal needs that need to be further researched. It works through mechanisms such as different ways of doing, relating, and associated roles and positions that we are describing in section 2. We also found that organizations are not developing comprehensive measures to incorporate women, which is the main challenge. Also, the differential contributions that lead to eco-innovation are not rewarded, even if acknowledged. Finally, we argue that the consideration of gender aspects in research and innovation policy, in particular R&I funding, is vital, but also a better representation of women in the innovation processes themselves.

In order to answer the questions above, our paper is structured as follows: first, we briefly describe the state of the art as regards the relation between eco-innovations and gender diversity and the resulting main research questions (section 1.1). Afterwards, we present the methodological approach of the patent analysis, namely the overall identification of green patents across Europe and the role that female inventors play, and the ways to design and implement the qualitative case studies in German and Spanish companies (section 1.2). Section 2 is dedicated to the three narrative questions presented above. Section 2.1: How and to what extent does having more women inventors make a difference in green patents and innovations? Section 2.2: Where do you see the opportunities and shortcomings do you see through the lens of gender in green tech? Section 2.3: What does your case teach us about responsibility in research and innovation as it relates to gender in sustainable innovation? The narrative ends with some conclusions and lessons learned for the SuperMoRRI project (section 3). The list of references (section 4) includes both literature cited in the narrative (in bold) and the literature that built the ground for the state-of-the-art presentation.

1.1 Summary of the literature review and research approach

Many studies report that gender positively influences eco-innovations. The potential causes for the observed link between gender diversity and eco-innovations are grouped in the third explained below:

1) Higher environmental consciousness of women (Zelezny, Chua, & Aldrich, 2000) (Schultz & Stress, 2009) (EIGE, 2012) (Hobach and Jacob, 2017: 9). (Kassinis et al.,2016, p. 9)

2) Different leadership behaviour (Horbach & Jacob 2017 p. 7, p. 8), (Ridgeway, 2001) (Datta Gupta&Poulsen&Villeval, 2013; Niederle&Vesterlund, 2007) (Liu, 2018), cited from (Nadeem et al. 2020, p. 3147).

3) Different social relations, networks and alliances; Nadeem et al. (2020) point out that women develop higher ethics of caring and are more concerned with the interests of multiple stakeholders, including society and the environment (Adams et al., 2011; Bear et al., 2010; Cumming et al., 2015)."

The references introduce different effects from women's leadership (in high positions like boards, attending to a minimum critical mass) and from – potentially - all women, derived from their education and values predisposing them to eco-sensitivity. The first conditions how the company functions and shapes its vision and mission (organizational aspects). However, women's leadership in firms is scarce. The second value/consciousness- conditions the way women inventors and female staff enrich innovation departments by bringing in diverse ideas to produce new products, services and processes. Nowadays, they are also underrepresented in inventions, and their potential diversity contributions could be jeopardized by inequality.

The third aspect- different networks- has been less explored, but also other studies in science show that women are building networks with more diverse actors from different professional communities (Díaz-Faes et al., 2021). Therefore, we have paid particular attention to this aspect that points to openness towards societal needs and grand challenges, as said, but is, of course, intertwined with leadership and higher environmental consciousness.

We also were interested in gendered participation in the different stages of the innovation process related to the maturity/novelty of eco-innovations. It is unexplored in gendering eco-innovations, while the innovation literature concedes great relevance to the aspect (Vona & Consoli, 2015).

To reach our main target, we have an open approach to map how perceived gender diversity is translated into eco-innovations. Previous studies used quantitative approaches that show clear patterns, and our contribution pursued to explore further aspects beyond the three cited before, opening the floor to their protagonists- women innovators -and how they perceive the enablers/constraints in their organizations.

In our interviews, we have asked about leadership, visions and values, relations/networks/alliances, and also asked about specific ways of doing and material conditions (resources, time, other), but mainly we have left room for open responses. Mapping gender diversity(ies) allow/s us to explore fine-tune mechanisms that shed light on how these diversities not only exist but are integrated into the innovation process.

Finally, we have considered that the business sector's approach to equality through diversity perspectives has been found to be less ambitious than other approaches—like inclusion that also approaches from affirmative action—that seek to compensate the more vulnerable actors. An idea of diversity that not counts from the beginning on power dynamics can easily obliterate social justice and be distracted from aspects that lead to effective equality, such as the possible need for affirmative actions that compensate the more vulnerable actors (Kirton & Greene, 2000) (Kossek & Lobel, 1996) (Johansson & Ringbrom, 2017). For instance, we shall consider that corporate cultures sometimes do

not acknowledge some structural factors that exclude women, such as not extending the job schedules to better conciliate with family responsibilities. In addition, we shall consider that gendered corporate cultures may consider masculine-related as the universal mean of efficiency or the right way of doing things (Acker, 1990).

So, in exploring the mechanisms to integrate diversity, we will also explore whether the diversity women can provide to the innovation process and the organizational functioning is valued and integrated with equal/unequal conditions. We approached the perceptions about this issue and possible measures of the organizations in dealing with it.

1.2 Methodological approach: Pattern results and data gathering for pathways

Our intended level of analysis was companies in Spain and Germany, and we planned to involve the inventors and other members of the firm in our interview programme. In addition, we were interested in exploring how the different stages and maturity of eco-innovations relate to gender.

However, the firms' collaboration in the study was almost null, and their participation in the early stages of innovation was too, so we finally focussed on the inventors' perceptions. The inventors have been identified through the Green Technologies Database (GTD) based on PATSTAT and through snowballing, as we detail in the following paragraphs.

Eco-innovations in our study are operationalized as green technologies. Specifically, the ones contained in the Green Tech Database (GTD), a resource developed to study green technologies using patent data from PATSTAT. GTD identified all the patent applications related to climate change mitigation and adaptation using the Y02 branch of the classification. This branch contains 44 technologies grouped in eight families. It identifies 425,743 patent families with at least one CPC code "Y02" from 1979-2018.

In there, we can find 85,115 families with at least one woman among the inventors (20.0%) and only 1,862 families where all inventors are women (0.4%)1.

Table 1: Green patents by Technology group

CPC Code	Description
Y02A	Technologies for adaptation to climate change
Y02B	CCMTs related to buildings, e.g. housing, house appliances or related end-user applications

1 More information in François Perruchas, Susanne Bührer-Topçu, Davide Consoli, Nicolò Barbieri, Richard Woolley Gender and Eco-innovation. 6th Geography of Innovation Conference, Milan. Parallel Session 1: Green & Sustainable Innovation 4th-6th July 2022

Y02C	Capture, storage, sequestration or disposal of greenhouse gases [GhG]
Y02D	CCMTs in information and communication technologies [ICT], i.e. information and communication technologies aiming at the reduction of their own energy use
Y02E	Reduction of greenhouse gas [GHG] emissions related to energy generation, transmission or distribution
Y02P	CCMTs in the production or processing of goods
Y02T	CCMTs related to transportation
Y02W	CCMTs related to wastewater treatment or waste management

Source: François Perruchas et al.,*WP5 Gender, eco-innovation study. Data report* (2021) Internal document of the SUPER_MoRRI project

The GTD also allowed us to classify the inventions by country and stage of the life cycle of the technology (TLC): 1. emergence, 2. development, 3. diffusion and 4. maturity. The GTD was genderized using the names of inventors allowing to observing the following conclusions-patterns2:

- The increasing presence of women over time among inventors of technologies for mitigation or adaptation against climate change in all technology groups.
- Along the life cycle, gender-mixed teams are: a) always associated with impactful inventions, with high coefficient, b) negatively associated with novel inventions at the last stages of the technology life-cycle, c) associated positively with original inventions at the beginning and the end of the TLC.

So, the pattern or the positive relation of gender and eco-innovation was confirmed in the green technologies database, even if there are many further issues to delve into, such as regional disparities.3.

Exploring the pathway or the motivations of this pattern was nowadays the primary goal of the case study, approached with qualitative methods (interviews). The initial study design involved firms in Spain and Germany. We wanted to know more about inventors' perceptions and other members of the firm that influenced the companies' innovation processes. We designed interview guidelines for the female inventors, and Human Resources directors and CEOs to gather a more comprehensive view of how gender diversity was perceived in the context of innovations and possible facilitators and barriers. We also wanted to know how gender diversity is related to the early-late stages and maturity of the technology life-cycle.

We used the GTD to identify suitable firms that meet the following further criteria: a) the female rate of inventors for one patent had to be higher than 50% so we ensure a critical mass of women b) the patents were registered between 2010 and 2016 (last year included in the database) c) the technology life-cycle was between 1-3, the early-diffusion stages (if not enough patents were listed, the data selection was expanded to 4).

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2 Ibid.

In the Spanish case, the database offered over 100 patents for the period 2010-2016, but just 10 in the early stages (1, 2, 3), which were just 2 firms after manual database refinement. The German case was similar, with 214 for the period 2010-2016 and just 28 in the early stages.

However, the main barrier was that the firms were not willing to participate. General disinterest in social research or particularly the rejection of gender research could be at stake in the motivations. In Spain, 25 firms were approached, including all in the early stages, including mailing and diverse phone calls. In Germany, 27 people were approached. Almost all refused to provide contact, both in Spain and Germany, arguing privacy issues in the last case.

For these reasons, we focussed on the inventors and used additional snowball techniques to identify female inventors from other organizational origins. The snowball strategy was the most expedient strategy for getting in contact with people directly. The resulting sample is in the following table:

Table 2: Information about interviewees

		Type of institution	Country	position
i1	Researcher	Big company	Spain	Mid-management at the innovation department
i2	Researcher	Big company	Spain	Mid-management at the innovation department
i3	Researcher	Big company	Germany	Staff at the innovation department
i4	Researcher	University	Germany	Professor
i5	Professor	University	Germany	Mid-management and researcher
i6	Researcher	Research organization	Germany	Mid-management at the innovation department
i7	Researcher	Research organization	Germany	Mid-management at the innovation department

2 RESULTS

2.1 How and to what extent does having more women inventors make a difference in green patents and innovations?

As presented above, the quantitative exploration in the green patents database and the literature review showed that the existence of women within diverse teams tends to produce more green innovations than homogenous inventor teams. In our interview-based case studies, we, therefore, aimed to understand how exactly which kind of diversity influences the innovation process, i.e. what the underlying mechanisms and pathways are.

The following presentation of the main results follows the main key influential factors identified in the literature:

Consciousness and perceptions: Women are already more interested than men in green issues during their studies at the university, as stated by i1. It is a question of vital purpose and also going away from the already colonized white men "dinosaurs", meaning the established and conservative hierarchies (i1). i2 sees no differences in age or mentality predominant to gender, as she exemplified in her direct boss, who promoted a positive mentality within the company towards innovation with fresh ideas from abroad. No differences regarding men and women in their global vision that concern eco-innovations are also stated in one interview in Germany, but generally, all acknowledge this differential consciousness.

Our work thus tends to confirm the literature but also shows that even if gender differences in career paths are acknowledged, neutral or individual-guided preferences are the preferred explanation for some women inventors.

Leadership styles: Our interviewees state that women at the top levels are found to be more explorative (i1), while women are, at the same time, more persuasive and more prudent (i2), which entails sometimes slowing down some processes and results. I1 and i2, from Spain, refer to men at top levels as being more aggressive when it comes to communication. However, both report a need for more women in top positions as problematic. All the interviewees agree that there still needs to be more women working in STEM and engineering-related jobs. Just i3 seems to accept that it is "natural" not having so many women working in engineering as the "typical" women-related jobs are in education and similar "social" professions.

Women inventors thus perceive that women have diverse leadership compared to men, that we connect with the different ways of doing things and behaving that will be explored below. These leadership styles can be connected with responsibility issues such as anticipation (prudency, slowing process), but, as both the literature and the interviewee remark, the effect of this diversity is limited, considering that few women are in top positions.

Continuing with less explored aspects in the literature that came out from the interviewees:

Ways of doing: In i2's case, many more women hold a PhD, which can open visions and ways of thinking. Most of the inventors thought that women work more focused (i6), more collaborative (i6), communicative, empathetic (i4), organized (i4) and are more willing to engage with the content of their work.

Women seek the project benefit over personal status, so they have intrinsic versus extrinsic motivations (i1). One of the interviewed researchers from Germany said: "Most men care about showing publicly when they were successful in an innovative development; Myself, I don't care if my name is written on it or not". I am just happy to be part of something innovative." In addition, women tend to integrate hard skills (rational, pragmatism, oriented to result) with soft skills (collaboration, communication), while men tend to show more hard skills (i1).

In an open question, many issues were mentioned by women inventors as all perceived differences. Those are related to values and visions about what is needed/good for the collective, and this can lead towards more responsibility in connection with possible eco-sensitivity. However, it depends on their possibilities to shape the scope of the project.

Non-on-top management positions: i2 says that the majority of people managing at mid-level are women, recently, they hired people and most of the applications came from women. This career path's gendering is unclear, but it could affect the innovation process towards greener outputs. As i1 from Spain states, she selects projects following the roadmap of the firm (strategic plan). Therefore, with caution - as they are mid-level managers and are not holding all the decision power or are not part of the corporate vision settlement (men-dominated boards in both cases) - women may have some chances to influence the process, in the Spanish case.

The scarcity of women in high-level Management is a barrier to integrating diversity, but the possibility that women are influencing eco-innovations positively through mid-management positions is an interesting future path of research, still if just mentioned in the Spanish case.

Some interesting aspects are: how they can trigger projects that finally are implemented towards more eco-responsibility trends, if they deal and how with a possible more conservative vision of the firms, or how possible more collaborative mid-leadership with external and internal actors can contribute. Therefore, it becomes clear that there is enough expertise on the market and an opportunity to bring more women into decision-maker positions.

Team-level diversity integration: All of the interviewees prefer working in diverse teams. Diversity allows exchanging abilities but also leads to difficulties understanding each other among teammates (i2). In her context, gender roles within teams were clear: men in technical positions, women in management ones (funding and project management). Comparing the interviews conducted in Germany, there was a clear difference in the question if gender diversity matters for innovation or not. The only interviewee coming from a company did not see any difference and no influence by gender, whereas the

representatives from the research institutions did. One of the interviewees from a research institution confirmed that teams in STEM still consist primarily of men. Even though, the way how men and women work is stated as being very different. In one of the Spanish firms, team-level work was clearly genderized as said: men in technical positions and women in project and funding management.

Ways of relating: i1 talks about many differences in relating outside of the company. She holds different relations with women from other companies/institutions, and they understand better as they share a perspective (see 'ways of doing'). That could be described as gender-to-gender homophily or the tendency to relate more to our own gender. In addition, interestingly, she reports a) more openness to diverse external actors, as recent research is showing with scientists (Diaz-Faes et al., 2021) and b) more collaborative ways of relating, such as not sending commercials but proposing the co-development of projects. The German professor summarised by saying: "You automatically attract people who suit you." She believes that the contribution to innovation does not necessarily have to do with gender but with characteristics that may be related more to men or women, respectively.

That can be a central point in how eco-innovations are positively gendered, incorporating more actors with the closest visions to ecological concerns as women tend to have, but also in a more collaborative way.

Influencing other gender behaviour: In the German case, two of the interviewees said that women work more straightforwardly and orderly and that most men can be characterized by lacking communicational skills. One woman said: "Men work in a more communicative way when there are more women in the respective teams." This points to the way that participants' accommodation in a team is also gendered.

Innovation life-cycle stages and gendered participation: One of our targets in the case study was to explore participation in the innovation stages (early versus maturity stages in technologies). The firms worked with a different language (TRL) that could be translated into life-cycle categories. The interviewees confirmed the observation of the results of the Green Tech Database for Spain and Germany: firms focus on more mature technologies to only incur a few costs, except in cheaper digital developments, even if novel-risky (i1, i2). No more results could be expected with more samples as the patenting level in Spain and Germany at the initial stages is low, as explained before. Even in the mature technologies, no gender results were gathered looking at the patenting process, maybe because it was one of the first questions and more time is needed to warm up, maybe because the differences that appear in the pattern study cited before, will be situated within other detected mechanisms such as the ones discussed below.

To conclude this section, we point out that there are differential contributions of women that are generally acknowledged. Those aspects are related to the organization's practices, which is crucial as the following statements show: i6 stated that at her institute, more than women constitute 40% of the staff and that they are becoming more. In her opinion, the influence of human-centred topics leads to a higher share of women in the innovation process, and she thinks that a higher share of women has a positive influence

on green innovations. i7 also works at a research institute and believes that women often respond more to keywords such as "environment", "sustainability", and she sees a noticeable effect, especially in reactions to job advertisements, which is crucial for the institute's recruiting processes: the emphasis is put less on technical but more on the perspective application. Through this, they have also recently managed to recruit two female mathematicians. I3, who is a researcher at a big multinational company in Germany, trusts that the driver for more green innovations is mainly supported by women even though, in her case, the economic benefits of producing green products are the main reason why her company supports these measures; i4 believes that there is a general "greener opinion" by women than by men which were already stated above when talking about consciousness and perceptions).

These observations support how diversity is expressed in intertwined aspects that we have dissected for analytical purposes and how the expression of diversity is connected with inequality and the scarcity of women. In the following section, we present in more detail how women inventors perceive the connection between inequality and organizational practices.

2.2 Where do you see the opportunities and shortcomings through the lens of gender in green tech?

The shortcomings are situated in the corporate culture regarding equality. The drivers of green innovation in the firm are clearly situated in profit, as reported by i1, i2 and i3, with no engagement with social issues. The lack of equality measures points it out, too. In contrast, one interviewee from a research organization in Germany said that companies and research institutions are not able to change an existing system. Cultural and political changes must be the main driver because otherwise, nothing will change in a work environment.

In the organizations, if existing, there is a liberal and the same-as-equal approximation to equality: there are not many measures taken at the Spanish companies to incorporate women's possible diversity or acknowledge they could have more barriers, except in i1's case with a mentoring program that has not been discussed with the women previously. In that case, diversity can be incorporated through the extra effort of women or can be hampered, as it is shown in how firms' masculine-universal basis tends to make it difficult for women to fully participate and show their diversity in an environment that tends to have a different majority approach, that is the men majority viewpoint.

However, both Spanish companies have a gender equality plan (GEP) which is mandatory by national law; but the GEPs seem to be unknown. I2 cannot report any measure. During the covid-19 pandemic, they were allowed to work at a distance/from home just in her department because of their open-minded director, but the justification is the pandemic and not equality. I1 reports that the company's mentoring programme offended her a bit as it is like “adopting a woman”. In addition, one German managing researcher from an RPO believes that some women's promotion programs are used as window dressing

and sometimes to employ a woman because there is a funding scheme motivating the hire, which makes the employment cheaper.

Furthermore, most of the interviewed researchers do not support women's quota as they feel to be integrated into some activities not because of their expertise but because of their gender. This same managing director shared an experience where she was asked to be part of a conference presentation. Her male colleague agreed to leave a speaking part to her since "it would be good to have a woman on stage, too". Another researcher from Germany doubted once when she was offered a group leader position whether this was only due to fulfilling a quota or due to her as a competence bearer (i7).

The lack of women in top-management positions was a topic during most of the interviews. Both Spanish inventors report low rates of women, which is the main problem of aspired equality. They also speak about the gendering of top management-board positions, which puts women in "typical females" positions such as Corporate Social Responsibility or Communication. It happens even if the president is a woman. All the interviewees stated their observation of a small representation of women in leadership positions; one even admitted not being sure about climbing up in the hierarchy because the higher you get, the fewer women will be with you sharing the same hierarchy level.

I2 reports that the mid-management positions at her company held by women were better paid than the technical ones held by men. However, it could be related to a higher educational level (PhD) compared to her own role. I1 reports that the differences represented in relations, motivations, etc., are acknowledged but not rewarded (salary or other). The university professor from Germany explained that her female colleagues always complain of not being taken seriously by their male same-level colleagues. She observes that men need more attention and reward for their work.

Three of the seven interviewees proposed concrete measures to bring more women into engineering and STEM jobs. A cultural change has to be made already at school when pupils decide what they want to study and where they want to work. In Germany, the so-called "girls' day" is offered by companies at schools or the companies' own premises once per year to present atypical job opportunities for women. Some of the interviewees stated that in their near surroundings of friends and family, they did not always have support when it came to choosing what to study or where to work when they were still young, as they were following a career path that was not typically meant for girls. This kind of event can break the barriers and open new opportunities for girls and women. I1 suggests a possible positive impact of promoting women networking within innovation processes.

These shortcomings can be turned into opportunities to act on equality within companies and research environments.

2.3 What does your case teach us about responsibility in research and innovation as it relates to gender in sustainable innovation?

Our case study shows that there is a pattern that connects women's participation with more eco-innovations. The pathway shows a possibility of diversity expressed in environmental consciousness but also in leadership in a more participative way, with more prudent and focused projects and different ways of working together, bringing more actors together in more collaborative ways of doing This could lead to changes from commercialization approaches to co-development approaches that have more chances to include anticipatory visions about the impact of the innovations, both positive and negative.

Furthermore, including more perspectives in the innovation process seems crucial for out-of-the-box thinking, leading to new and future-oriented ideas. Including "women" and "men's perspectives and ways of working leads to higher quality assurance in proving the applicability of innovation results for society in general. One of the interviewees said: "The more diverse a team is, the more aspects are considered. There are just benefits."

In addition, the question of how more women in research and innovation teams could change men's attitudes towards more eco-innovation in the teams, or selecting projects at the mid-management level, together with how they interact with external actors, can be a relevant path for future research. In particular, given that the key point of the identified pathway is the scarcity both at horizontal and hierarchical levels of those actors more willing to engage in eco-innovations (women), organizations still need to sufficiently address this problematic lack of presence or reward the differential contributions.

However, even if organizational-based measures are absent, i2 reports a significant impact in their department since the gender clauses have been included in the calls for public funding, both in Spain and at the European level. Those funding calls ask for gender-diverse teams, among others. Furthermore, the inclusion of gender aspects in the definition of public research and innovation programs and their funding mechanisms are expected to have an impact on addressing societal needs.

All these aspects, increasing women in teams and decision-making positions as well as the integration of gender aspects in research and innovation processes, are strongly related to RRI as research cannot be perceived as being socially responsible if half of the population and their specific needs are neglected.

Our study points out that nowadays, more women's participation is recommended in the definition of the various policy measures, as quotas are producing unintended consequences-doubts in women, as they do not know if they are acknowledged by their gender or their professional competencies. We are not suggesting skipping quotas as it is the only cited measure functioning, and the lack of women's presence is the main problem. However, more discussions on how to improve the participation and representation of women in innovation policy are needed. In particular, future measures should address top- and mid-management positions and not only research teams or projects. Such a discussion could also enrich the design of responsible innovation policy instruments, aiming at bringing objectives like contributing to the SDGs forward.

Consequently, some key aspects arise regarding monitoring: 1. to monitor women's presence in diverse hierarchical positions in firms, going beyond the research-academic sector or the project-based-monitoring associated with funding 2. To monitor women's participation in defining innovation policies and funding schemes.

In light of our results, more research is needed to investigate whether gender diversity can be used as a proxy indicator for openness towards societal needs, as women tend to work with a greater variety of actors. It is also helpful to shed light on how to promote more collaborative multi-actor innovation projects.

3 Conclusions and reflections

Even though the case studies could not be carried out as planned due to the companies' reluctance, the interviews with female inventors have yielded numerous key insights into the connection between gender diversity, equality and eco-innovation.

First, the central assumptions from the literature were confirmed, in particular, the positive influence of diversity on the emergence of innovations in general and the particular sensitivity of women to environmental and sustainability issues. Furthermore, women and men differ in their ways of doing, their associated roles and their collaboration networks.

More women within teams and in mid-managing positions could be changing the ways teams work towards more green perspectives. However, still, all interviewees cite the need for more women in top positions to set the strategies within the organizations to obtain broader effects of diversity. In order for this diversity to actually come to fruition, a critical mass of women in decision-making positions in organizations is necessary so that they can actually exert influence and initiate a change process. Also, their participation is needed in the systemic configuration of innovation policies, including regarding the measures addressed to inclusion and diversity.

4 References in the text and literature review

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