Lost (and found) in Transition: Expert stakeholder insights on low-carbon energy transitions in Spain

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Abstract

Despite losing its low-carbon energy transition path in the last decade, Spain, since 2017, has picked up its commitment to complying with the objectives set out in the Paris Agreement for ratcheting 2030 and 2050 ambitions. This research departs from an extensive in-depth expert stakeholder engagement, proposing a research process *of scoping:* reaching out to academics, NGOs, administrators, energy providers and the private sector among other agents that guide the future of transitions in Spain; *of listening: identifying*, through interviews, the knowledge gaps; *of understanding:* manifesting answers of the multitude of over 200 expert stakeholders and *of participating:* extending out and disseminating results. We present five central emerging themes on: ambitions and temporalities of targets highlighting ambition gaps across stakeholder groups for 2030 and 2050 objectives; the future of carbon and nuclear energy pushing for eventual closure of both across distinct points in time; the rollout of renewable energy technologies in a transition pursuit; preferences on fiscal and policy measures to facilitate investments and priority sectors of action and ultimately discuss gender equality and justice, and the lack thereof, in energy decision making. Our research summons up the delicate intricacies of the transition debate in Spain, setting a discursive space in hopes of contributing to the future design of the Law on Climate Change and Energy Transition.

Keywords: Energy transitions; Climate policy; Stakeholder engagement; Spain; Energy decision-making, energy justice

1. Introduction

Against international optimism set out through the Paris Agreement, climate and energy politics are falling short [1-3] in achieving emissions reductions that are effective and equitable at all levels [4-8]. Countering such challenges at the required speed, magnitude and urgency to curb emissions to well-below 2 degrees [9-11] requires local, national and international authorities, scientists, civil society and communities to act across all fronts [12]. As a part of the post Paris efforts, the Talanoa Dialogue has been launched for helping countries implement the Nationally Determined Contributions (NDCs) by 2020 through creating inclusive, participatory and transparent dialogue in order to share visions, build empathy and to make wise decisions for the collective good [13]. Ultimately, generating viable energy narratives and plausible climate futures implies that all relevant stakeholders board the desired "transition train" [14] for this societal quest at large.

Spain´s recent bleak path of persistent, retroactive, regulatory changes resulted in a renewable energy paralysis [15-17] and a loss of its low carbon transition pathway. Yet, since the end of 2017, Spain has picked up its commitment to complying with the Paris Agreement objectives and further yet and within the framework of the European Union and has begun the elaboration of the Climate Change and Energy Transition Law. Since June 2018 (and renewed once again in cabinet in April and November 2019), Spain counts with a new Ministry for Ecological Transition for the first time in history. This formation, merging the former Ministries for Environment and for Energy, is also lead by a female minister. In terms of climate targets, the new ministry, has drafted the Spanish National Energy and Climate Plan 2021 -2030 [18] focusing on 2030 targets and more determinedly lay the foundations for reaching a neutrality of emissions scenario by 2050. Spain´s controversial "sun tax" has been scraped (October 2018) [19-20] and transition efforts have been supported by a regulation on self-consumption (April, 2019) [21], freeing the pathway for renewables and "citizen participation".

In this research, inspired from a global REN21 report [22], we gather emerging energy-society debates [23] in Spain collected from over 200 expert stakeholders to co-create transparent, inclusive and meaningful discussions. We highlight narratives [24] drawn from new data that we have collected through our stakeholder dialogue that: (i) present the diversity of views of actors to build more inclusive and plausible low carbon pathways (ii) serve as guidelines for the future design of the Law on Climate Change and Energy Transition in Spain that will require social and institutional rearrangements.

Our research emphasizes the importance of an inclusive transition debate, using expert stakeholders' perceptions as sensors, to observe synergies and potential bottlenecks around priority areas of concern and action. Therefore, the methodology embarks on capturing the diversity of perspectives on energy transitions (Section 2.1), the scoping (Section 2.2), the listening (Section 2.3), the understanding (Section 2.4), the participating (Section 2.5) and the central emerging themes (Section 2.6) as vital stages in apprehending the breadth of the debate. Within the scope of this analysis, we have sought expert stakeholder participation (rather than public opinion) in order to set the stage, covering issues requiring anticipated knowledge.

We aim to contribute to discussions on ambitions and temporalities of targets in transition debates (Section 3.1); the fundamental role of carbon and nuclear power plants (Section 3.2), the rollout of renewable energy technologies in such a pursuit (Section 3.3);

preferences on fiscal and policy measures to foster transitions (Section 3.4) and issues of gender equality and justice in energy decision making, covering questions such as reconversion, distribution and multiplicity of the perspectives (Section 3.5).

Section 4 complements obtained results from a critical perspective bringing forth bottom up organizations and movements within the larger in built political panorama of low-carbon energy transitions discussions in Spain.

Finally, in section 5 conclude with timely yet relevant discussion points for contributing to the future design of the Law on Climate Change and Energy Transition in Spain.

2. The Stakeholder Engagement Process

2.1. Capturing the Diversity of Perspectives on Energy Transitions

Technocratic approaches reveal too narrow for policy making on complex and "wicked" sustainability issues involving high and divergent societal stakes and (scientific) uncertainties [25]. As Jasanoff (2017) [26] highlights, political arrangement at high governmental levels will not solve the problem of the energy transition unless it speaks convincingly to needs and aspirations of people with more inclusive politics. Therefore, our Spanish case study, poses a collection of transition narratives from expert stakeholders in Spain, capturing the diversity of perspectives in compliance with post Paris pledges and rising ambitions.

For doing so, this research emphasizes the importance of the process [27], a robust and appropriate research design [28] and participation as a goal in itself [29-31] equally as, if not more, valid than outcomes or results. Reflexivity through stakeholder engagement; incorporating diverse visions not only adds legitimacy [32] but also improves the overall quality and credibility of the research itself for transformative science. Transformative science, calls for a deeper understanding and increased societal capacity for reflexivity regarding transforming processes covering issues such as energy transitions [33]. The different perspectives and interests, however, posed by the multitude of stakeholders may not necessarily lead to a common understanding, as perspectives may be based on values and norms as well as hard facts [34]. This can be observed in our findings as divergent perspectives [25] on issues such as temporal targets of decarbonisation ambitions, types of technologies to be pursued or the policy mixes to be targeted.

Although general consensus on achieving low carbon futures exist; there is three-fold challenge on: the path *(how)* [35-39]; the speed *(when)* [40] and the actors *(who)* that are to lead low carbon transitions [14]. Our research intends to launch discussions on alternative ways for problem structuring and resolution [41] as well as serving as a mechanism to overcome institutional lock-ins, and elucidating risks [42] paving way for a dialogue.

The stakeholder dialogue, its timeline and phases can be seen in Figure 1. Following, we present five ***central themes*** that have emerged as a result of the stakeholder perceptions' on energy transitions.

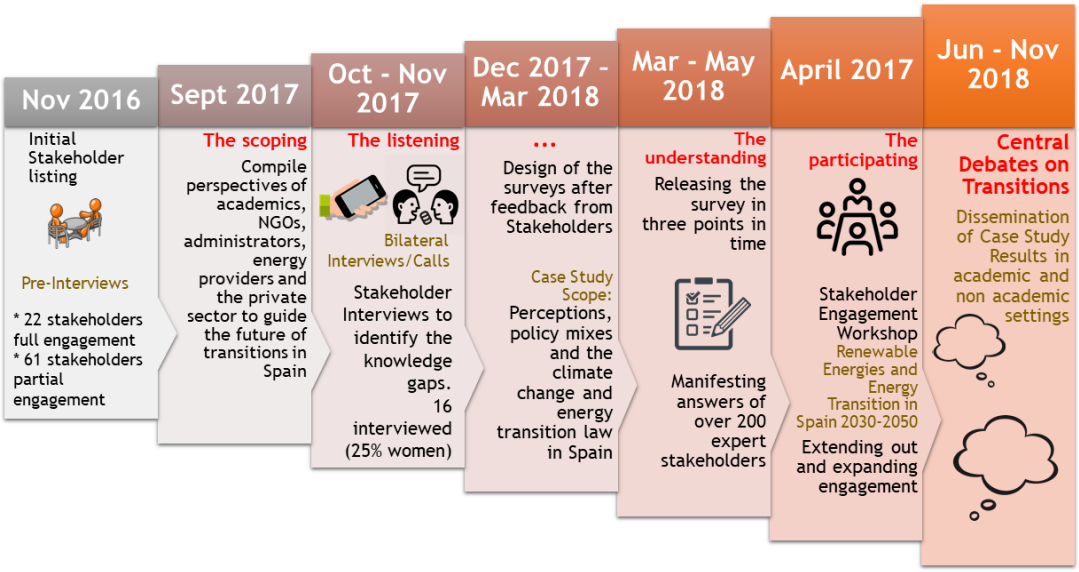

Figure 1. The stakeholder dialogue, timeline and phases

2.2. The Scoping

Paving way for dialogue, the scoping process has reached out actors that have decisive role in energy research, planning and decision making in Spain. The scoping has included energy generators (both public and private, both large scale and small scale), the government/administrative sphere, Non-governmental Organisations (NGOs) and academic representatives who, through interviews, have transversally defined important axes of discussion on energy transitions[1].

When dealing with complex challenges, none of these communities alone have all the tools to meet such societal challenges; thus stakeholder processes, especially co-creative processes [43,44], are increasingly promoted for creating collaborative roadmaps [34]. The expert stakeholder scoping process (an ongoing process since November 2016) (see Figure 1) has taken place either via full engagement: implying voluntary participation in all stages or partial engagement entailing less commitment, inputs via the survey and voluntary attendance to our workshop [45].

We underline that lay citizens have not been part of the scoping process, since targeted questions required a priori knowledge on (but not limited to) technical attributes on targets, percentages of renewables technologies, motives and barriers and policy mixes to facilitate the overall energy transition. A different survey on public opinion is essential. Experience or value based interests of laypeople in reaching overarching low carbon goals is of utmost importance [14]. In fact, a public consultation process for the design of the renewable energy transition law has been carried out by the government itself via a public consultation (from July 18 - October 10, 2017) [46] recruiting around 350 proposals as concerns expressed by the public. We acknowledge that public acceptability is essential for effective transition strategies or mitigation policies to be adopted, and equality and fairness play an important role in how such measures are regarded by public opinion [47].

[1] Within the initial round of scoping, financial entities, responsible for financing renewable energy projects, had also been contacted; however, refused willingness to be interviewed despite anonymity.

2.3. The Listening

Before constructing the survey section from our "ivory towers" we have made a deliberate attempt of "climatising" ourselves [48] to the discussions taking place across different actors in the Spanish energy transition debates. Thus, the listening phase consisted of interviews with expert stakeholders, for identifying needs and concerns that predominate the energy transition agenda required for the co-design of a survey.

Our semi-structured interviews focused on "what" questions regarding renewable energy technologies; "who" questions on the role of actors and sectors and "how" questions on criteria, policy mixes and scenarios for future low carbon pathways. The first block addressed controlled questions on decarbonisation and the promotion of renewables in Spain in the past and present. Stakeholders were then consulted on their visions for 2020-2030 and 2050; the future of fossil and nuclear fuelled power plants, on instruments (incentives, etc.) and infrastructures (smart grid, electric car, interconnections, storage systems, etc.); on weighting of criteria (economic, social, institutional, environmental, others) in policy making and on actors who have an important role in such a transition. The second block followed an open discussion.

From an initial sample of 24 stakeholders, 16 interviews were conducted (in person or via teleconference for 45-60 minutes). The sample covered energy providers of small scale energy cooperatives (n=2) as well as larger energy utilities (n=1); administrative entities (including associations, local and regional energy administrators) (n=3); NGOs spanning from local branches of national environmental organisations (n=1) to global ones with their respective national representatives (n=1) and academics/researchers (n=8) were working on different disciplines (with expertise in electricity markets expertise to ecological and environmental economists). Possible biases of having a small sample group, as well as biases resulting from high representation of academics have been countered during the survey launch, which were sent to a more open pool of experts. The representation of women was 25% (n=4); 2 from academia and 2 from NGOs. Such numbers are also indicative of the social structure of men vs. women (71% vs 29% - including administrative positions related to energy) in the energy sector labour distribution [49]. Gender and participation in women in energy decision making is a core theme of this research, thus we have deliberately made an effort to incorporate diverse visions and voices during the whole stakeholder dialogue.

2.4. The Understanding

Learning from the breadth and multitude of perspectives, we then articulated the different nuances of the narratives in the form of a survey to reach out to a broader audience. A 23-question survey [See Appendix 1] was designed and launched across three controlled points in time to ensure a gender and sector conscious distribution and representation. The survey was intended to be comprehensive yet concise. Therefore, several themes like the issue of natural gas as a transitory fuel, the problematic of the intermittency of renewables, the role energy storage, technology neutrality in policy, the operation of hydropower to manage for seasonality, a new design of the system to accommodate for the increasing the amount of renewable capacity or issues on how to increase the role of citizen participation via distributed energy and self-consumption were not designed as direct questions in the survey. When surveys are too long, there is the risk of losing the

interest of stakeholders. There were also some design caveats[2], resulting from the authors own scoping limitations, however we have tried to cover several of these as discussion points to enrich the debate.

During the period of over a month, spanning the three launches, the first round reached n = 83 during, the second wave n=141 and the final wave reached n=***206 respondents in total*** (See Figure 2). We have consciously extended and expanded to as many sectors as possible to reduce the academic (Figure 2A) and male bias (Figure 2 B) of participants through personalized reach-outs, snowball effects and using energy related associations' maligning lists. We ultimately acknowledge the lack of and therefore urge plurality of visions and gender sensitive narratives be incorporated into future practices and solutions [50].

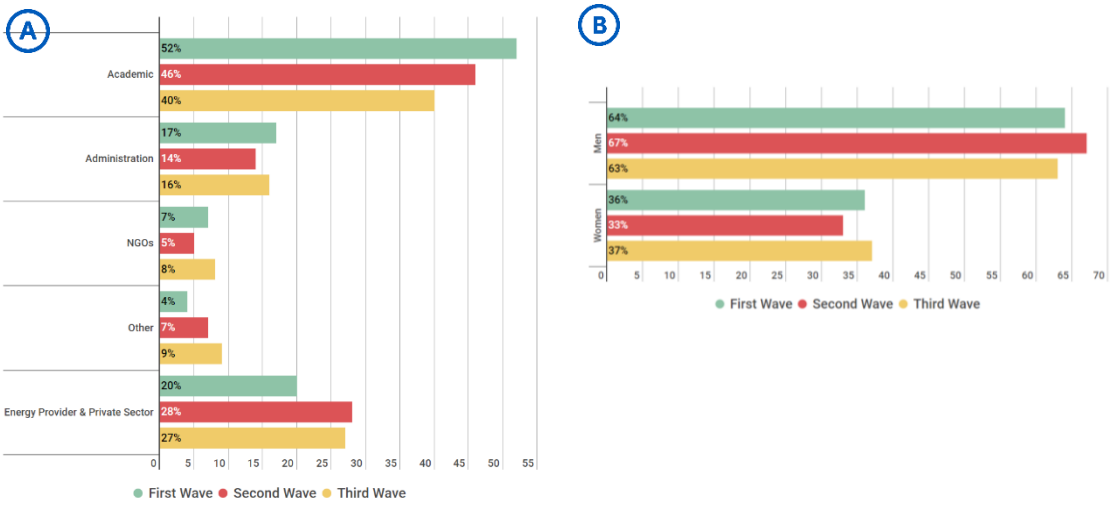

Figure 2. Distribution of Expert Stakeholders by Sector (A) and Gender (B) across the three points in time. *(The third wave has been used as final outcome of survey participants).*

2.5. The Participating

The Participating phase consisted of a workshop[3] with a twofold objective: i) to present and hand back [51] initial results of the survey within the "Renewable Energies and the Energy Transition in Spain 2030-2050" conference [52]; and ii) to engaging in dialogue with new actors. A roundtable discussion was held with live interactive audience participation (poll everywhere) reaching out to around 100 stakeholders; improving overall credibility and quality of the engagement process. The participating section also resulted unique, including a new group of stakeholders: journalists, interested in engaging with research and development on energy transitions as well. Thus, each process of the methodology as proposed, has had the ability to capture different groups of interested parties and visions each time.

[2] The questions reflect principle concerns of the small group of experts interviewed during Oct-Nov 2017
[3] The workshop was organized by the BC3 (Basque Centre for Climate Change (BC3)), the Spanish Association of Energy Economics (AEEE) and the Spanish Club of Energy (Enerclub) held in Madrid (April, 2018).

2.6. Central Debates on Transitions

Finally we highlight several of the key issues emerging from our stakeholder dialogue (as covered in Section 3), summing the discussion around five central themes within the Spanish energy transition debate[4].

3. Five Central Themes within the Spanish Transition Debate

3.1. Ambitions and Temporalities of Energy Transitions

One of the foremost concerns to tackle in terms of energy transitions is to define the outlook and the degree of ambition as supported by different expert groups within a foreseen timespan. Stemming from this aspiration, this dimension looks into the discrepancies across stakeholders regarding the transition as "an opportunity" or "not" and whether Spain should carry out more ambitious policies than those set out by the European Directives in line with the 2030 Energy Strategy for the EU [53] **(Q1** of survey**)**. Minimum compliance requirements as set forth by the EU include a target of at least a 27% share of Renewable Energy (RE) consumption - binding at the EU level. Based on path dependencies (grounded on past experiences affecting decision making), breaking points came about across different expert stakeholders: NGOs on one side of the spectrum acting as ambitious high flyers vs. energy providers and entrepreneurs posturing a more cautious outlook as seen in Figure 3.

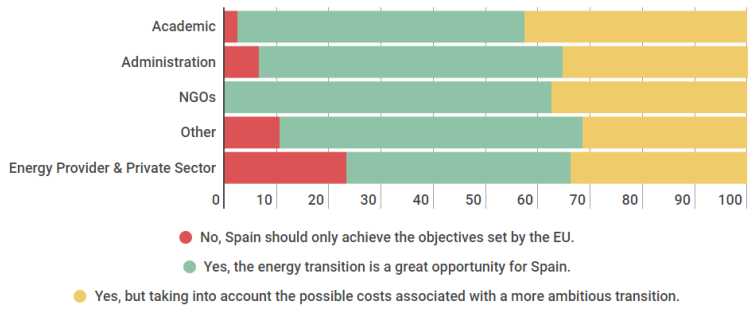

Figure 3. Degree of ambition of expert Stakeholders in Spain (Q1 of Survey)

Inferring from the listening process, underlying motives on diverging narratives surface from lessons learnt from the solar rollout example that Spain once experienced. Renewables, by the end of 2012 - at its peaking potential, ranked Spain third on the global scale in terms of total power capacity per capita (excluding hydro) [54]. However, in 2016, the fall of solar prices [55] combined with regulatory changes discouraging solar investment recoiled Spain to 5th/6th place [54]. Major *retroactive subsidy cuts* were implemented on renewables, in hopes of closing the already ascending tariff deficit reaching 26 billion € [56] by the end of 2013, lead to a great retraction of renewables deployment in the country overall [57].

Although the "sun tax" has recently been eliminated [58] –regulatory barriers piling up until have now hampered self-consumption of solar PV in Spain and the momentum and

[4] All supplementary material can be access via ZENODO data repository Supplementary material: 10.5281/zenodo.2594826

acquired velocity of change by investors and energy providers come about with caution. Spain, formerly a leader in Solar PV when the costs were too high, ended up paying excessive amounts in feed in tariffs (FIT); and now that the costs have been drastically reduced has become a follower despite having the natural potential of being a leader [15]. Lessons learned from the past has opened the debate on the agenda whether Spain once again should take on the role of leadership in renewables deployment or follow mature investments underway, following other national examples. In this regard, Grübler (1997) [59] illustrates the difference between early vs. late adopters of technology, where he indicates that initial adopters reach a higher market saturation level, while later adopters scale more quickly but less extensively [60]. Recent changes in policy supporting self-consumption [21], is likely to give tremendous leverage towards rooftop solar rollout, especially through energy cooperatives [61, 62] leading the forefront of the transition. We are yet to see if such regulatory changes can make up for the lost time of renewable retraction rollout in the past years.

Another fundamental element in this regard is the speed, or temporal dynamics [40], at which a transition can take place. Levels of ambition in terms of targets vary across the time horizons of mid-terms ambitions for 2030 and longer term objectives for 2050.

Principally for 2030, stakeholders set forth ambitions that should go beyond the binding minimum requirements of 27% of renewables at the EU level, in the final energy demand **(Q2)** (Figure 4, A). Yet, there is more optimism for 2050 indicating it will *almost* be possible for renewables to represent 100% of the energy mix **(Q3)** (See Figure 4, B). Several of the perspectives highlight that once breaking points on certain thresholds of renewable technologies in the final mix are transcended, a final electricity mix on green technologies might not all be that difficult. However, actual mechanisms on how to achieve net zero emission targets for 2050 vary. As similarly indicated with the UNEP Emissions Gap Report [63], divergences arise across stakeholders' expectations, ambitions and emission gaps, highlighting that major reinforcements both at the global level and on NDC ambitions are indeed necessary. Our survey questions Q1-3 reveal that while optimism and ambition is present, the trajectory of emissions reductions, gives weight for more transformation *toward the end* of the mid-century, focusing on an electrification of the system via renewables through supporting mature technologies rather than radical transformations taking place as of the present. Issues, such as tackling intermittency and the transition away from natural gas remain central themes to be discussed in the design of more ambitious roadmaps and the future of the Climate Change and Energy Transition Law at large.

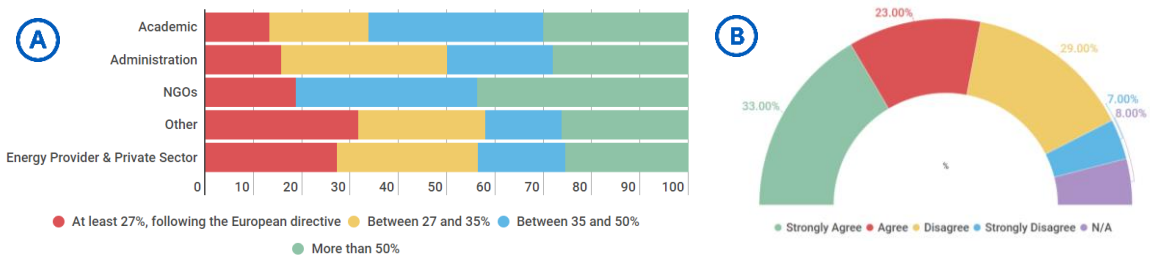

Figure 4. A - target of renewables (%) be in the final energy demand by **2030** by stakeholder group (Q2 of Survey); B – Opinion on possibility of possible for renewables to represent almost 100% of the energy mix by **2050** (Q3 of Survey)

Simultaneously, we have also carried out a statistical analysis[5] to assess for our sample significance and correlations between the survey questions (a cross-sectional analysis), focusing on ambition levels and age, education and sectors . Results of our analysis show that:

- While there is no significant correlation between age and ambition, those that are younger than 35 (in terms of significance) do not seem to be super ambitious.
- There is significant correlation between education and ambition[6]. We observe that university degree respondents are significantly super-ambitious, whereas those who are postgraduates are not significantly super ambitious. It seems that a certain level of education implies higher levels of ambition, however, the highest education associates with more cautious positions. It is possible that postgraduates are more aware of the possible risks that come about with an energy transition.
- We observe significance and positive correlation regarding ambitions Q1 (overall ambition) and Q2 (2030 targets) for academics whereas we observe significance and a negative correlation for the same questions regarding energy providers. This can be interpreted in two ways: either that energy providers have a more conservative outlook regarding short to mid-terms (goals) due to lack of trust in the regulatory changes and renewable energy paralysis [16] while academics believe that shortcomings of lessons from the past can be overcome; or that the current business as usual pattern of energy provision perpetuates established interests and relations, resulting in a reluctance toward change [61,64,65]. On the opposite end of the spectrum NGOs, result significant and super ambitious toward future ambitious goals.

3.2. The Coal and Nuclear Debate

Despite the IPCC SR (October 2018) [10] call, once again, for rapid decarbonisation at the global level, the sum of all emission related to CO_2 from coal fired power plants in operation or under way, indicate 233 Gt higher than the budgets of 1.5 and 2 degrees [66]. Within the European Union alone, 59GW or 20% the global coal power plants that are of 40 years of age and older need retirement plans in order to assist in the process of meeting international climate goals [66].

Although phasing out support for national coal production has preoccupied the agenda in Spain regularly, main motives have revolved around the criteria of profitability, covering both public and private mines due to high perceived costs and subsidies [67]. Greater efforts however, have been put forth with the new Spanish government highlighting interest on decarbonisation processes [68] covering a moratorium on new coal power plants while also drawing up of 'just transition' contracts. This agreement has been based on a larger global concern on the "Energy Transition and Climate Campaign" (rather than profitability as a former motive) indicating a relinquishment of coal while determining a just energy transition agenda in the mining regions in terms of employment [69] (for more info see section 3.5 on just transitions).

[5] For our statistical analysis we have (i) constructed a "dummy variable" for a regression analysis to assess for radical positions on overall ambition indicating those that are super ambitious and those pessimistic (columns 4 and 5 in Appendix 2) bringing together Q1, Q2 and Q3 of the survey on ambition opportunities and (ii) assessed for correlation of this dummy variables and Q1, Q2 and Q3 independently along a cross-sectional analysis, looking into factors of Age, Education and Sector specificities.

[6] Our sample survey respondents n=201 out of n=206 either have a university degree or higher.

In this respect, 62% of Spanish expert stakeholders have indicated closing Coal Power Plants before 2025 **(Q8)** (See Figure 5 (A)). This tendency can persistently be observed across each expert stakeholder group (Figure 5 (B)), most pertinent across the sector of administration. Succeeding, options either reveal closing of plants after 2025 (13%) or continuation of their activity with Carbon Capture and Storage (CCS) (13%). The latter option, opted mostly by academics (17%), also bring about diverging views on techno-fixes in terms of their (non-)viability at imagined scales [70] as well as their economic (un-)feasibility [71].

Nonetheless, general inclination on the dissolution of the future of coal has become a dominant narrative rather than its prolonged continuation.

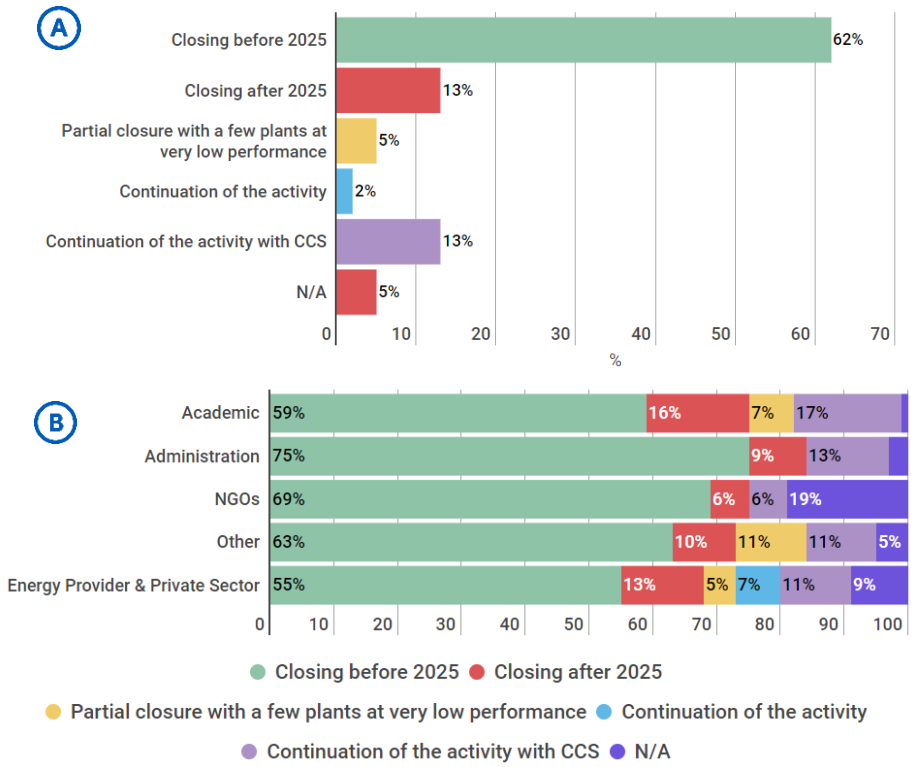

Figure 5. A – Overall outcome on the future of coal-fired power plants; B – Opinion of stakeholder groups on the future of coal-fired power plants (Q8 of Survey)

The future of nuclear results more uncertain. Past social-political decisions on nuclear investments [72] have created ambiguity in terms of infrastructural lock-ins. Debates revolve around the closure at the end of the reactor's life time, the technicalities involved in defining lifetimes and whether extensions are viable [73]. Currently there are five active nuclear power plants with seven reactors producing 21% of the country's electricity (or ~55000 GWh per year in 2018) to the national electricity system [74]. In 2011, the Spanish government had lifted the 40-year limit on all reactors, allowing owners to apply for license extensions in 10-year increments [75] with an industry report recommending (in principle) 20-year operating lifetime extensions [76].

As such, the diversity of opinions of experts vary marginally along the spectrum of nuclear futures **(Q10)**. **45%** of stakeholders have indicated a closure at the end of their lifetimes, while **29%** have opted for immediate closure and **17%** have indicated an extension of 10-20 years of their lifetime (See Figure 6(A)). While a majority of NGOs opt for immediate closure (63%), the other end of the spectrum of energy providers and

private sector (29%) express interest in extension of lifetime of 10-20 years and 9% supporting for an expansion of number of existing plants (Figure 6(B)).

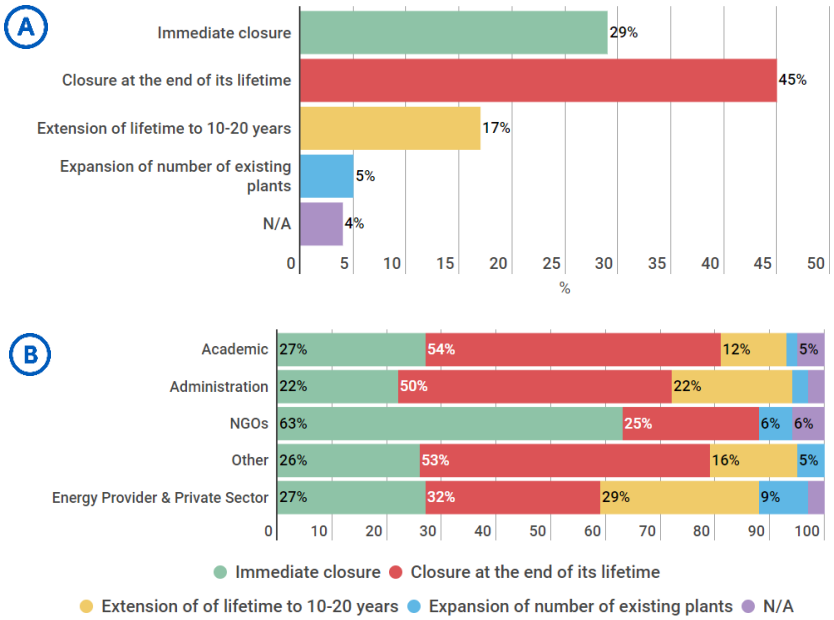

Figure 6. A – Overall outcome on the future of nuclear power plants; B – Opinion of stakeholder groups on the future of nuclear power plants (Q10 of Survey)

Here, we acknowledge that unfortunately an emerging issue with the debates that revolve around nuclear and coal phase out is the rise of natural gas, used as a transitory fuel[7]. Natural gas poses a threat not only in terms of prolonging addiction to fossil sources but also in terms of uncertainty of related fugitive emissions of methane being greater than foreseen [77,78]. There are increasing movements driven by citizens and NGOs against the use of this technology in the energy transition [79]. On the other hand, new gas-plants are very unlikely in the next decades in Spain given the current exiting spare capacity and the requirement of these to support renewables intermittency.

Another concern not covered within the scope of this paper is that of intermittency of renewables. Once again, natural gas, might serve as a central "bridge fuel" for the transition. Yet, we believe that this case will be more prominent and problematic for the period of 2030-2050 when the electricity system will transition, toward 100% renewables as indicated by a majority of expert stakeholders (See Figure 4, B) and eventually gas-plants will need to be phased-out as well. In such a case, intermittency management of renewables will need to go beyond a substitution vision (via natural gas) or a technological switch (to storage alternatives) looking into more definitive, transformational changes [80-83] such as demand side management and/or a reduction.

While the debate of an eventual closure of coal-fired power plants revolves primarily around territorial politics (Figure 8), a principal interest namely for Spain's northern mining regions – Asturias, Aragón, and Castilla y León [69], state politics and social

[7] Coal and nuclear phase out currently pose as the most controversial issues in Spain dominating the agenda as posed by stakeholders. Therefore, and for the sake of simplicity in the understanding and survey construction phase, we placed focus on the future of these two fossil technologies and their temporalities rather than on transitory fuels.

motives also emerge as vital dimensions **(Q9)**. The nuclear dilemma however, centres mainly around state politics **(Q11)**. National decisions are conclusive in nuclear futures since economic drivers of payback time of infrastructure investments are a major concern, along with likely increases of electricity prices and lock-ins (Figure 7). Furthermore, stakeholders perceive that the Spanish electricity system is more than ready for an energy transition, since few of them identify technology as a main barrier for closure of coal or nuclear power plants, showing that the main barriers emerge from politics and social controversies. Thus, the transition implies a social and political intervention and reorganization at large, based on prime factors that have been highlighted though our dialogue.

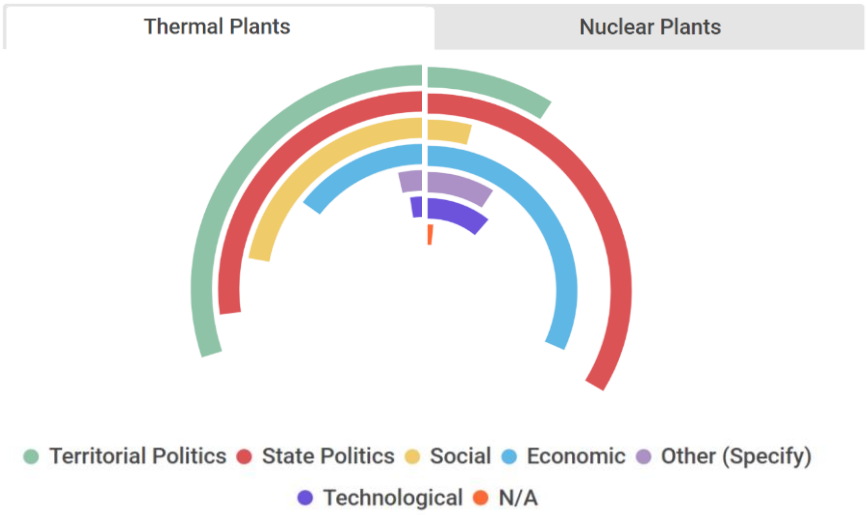

Figure 7. Identified barriers for eventual closure of coal and nuclear power plants (as indicated by expert stakeholders) (Q9 and Q11 of Survey)

3.3. Quo Vadis Renewable Technologies?

The energy transition implies displacing the current installed capacity of fossil resources with renewables [84] rather than a mere addition to the saga of energy consumption and growth [85].

In relation to future aspirations of how stakeholders see the evolution of energy production systems **(Q14)**, there is an evident inclination toward decentralization and smaller scale production systems; 26.3% as indicated by the stakeholder barometer (See Figure 8). This, without doubt, pushes for a consensus on investment in renewables, evolving in a more decentralized fashion, indicating a more dispersed control and management of energy production schemes. This evolution implies a more transparent, direct and grounded forms of redefining our relationship with the energy we consume [86] as well as challenging different forms of societal domination over energy decision making [87, 88].

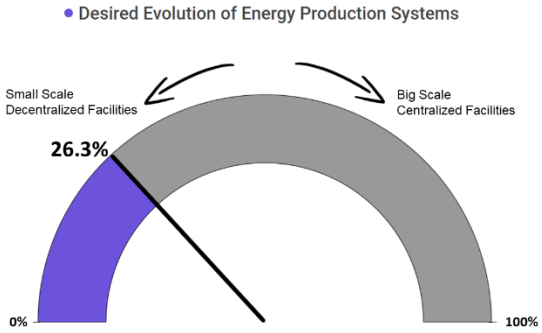

Figure 8. Desired direction of energy production systems (as indicated by expert stakeholders): Min: 0% Small Scale, Decentralized Facilities; Max: 100% Big Scale, Centralized Facilities (Q14 of Survey)

There are several other layers to the discussion of a transition to renewables and their penetration into the final energy mix. This multi-faceted question can be looked into from two complementary perspectives: initially in terms of the weight of renewables in the midterm future covering the next 15-20 years **(Q4)** and regarding the momentum at how renewable technologies are picked up **(Q5)** (Figure 9).

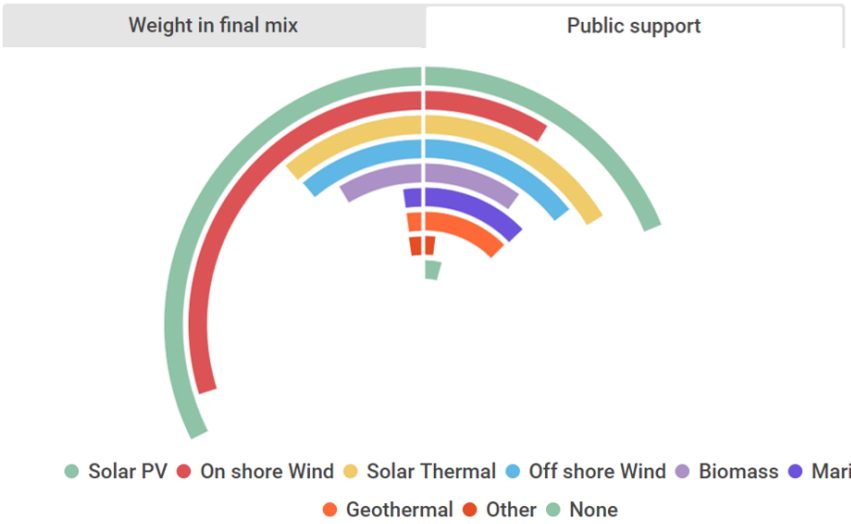

Figure 9. Renewables' weight in the final energy mix vs. public support given to renewables by technology type (as indicated by expert stakeholders) (Q4 and Q5 of Survey)

In terms of the weight of renewable technologies; there is wide-spread confidence among most stakeholder groups that primarily solar PV and onshore wind will be followed by solar thermal (referring to Concentrated Solar Power (CSP)), and offshore wind technologies in the near future.

From a complementary perspective, during the interviews, questions emerged in terms of public support invested (if any) to pertinent renewable technologies to lead the renewable transition and for becoming competitive within markets **(Q5)**. The debate stems from technology-specific renewable energy support mechanisms based on differentiation across levels of technological maturity (e.g., onshore versus offshore wind power) [89] vs. the technological neutrality debate (not incentivizing one specific technology over anther). The European Commission on this matter has sustained the use of technology-

neutral support schemes over the years; however, it also acknowledges that in view of the different stages of technological development of renewable energy technologies, technology specific schemes may also be motivated [90, 91].

Although some (few) stakeholders have opted for no public support, solar PV, solar thermal (CSP), offshore wind, marine and geothermal energy can be potentially viable options given public encouragement in terms of reaching maturity. However, most stakeholders have chosen to support technologies that are already mature, such as Solar PV or on shore wind, instead of supporting other less mature energies, such as geothermal or marine, where there is more room for improvement.

3.4. Fiscal and Policy Measures to Foster Transition

Fiscal measures, regarding the allocation of taxes and government expenditure for facilitating an energy transition and the use of market based instruments, is a common practice in European policies. The use of taxes to correct environmental externalities is a standard public finance proposition. Here, potential areas of investment of are presented, prioritizing certain themes as indicated by stakeholders, rather than treating these issues as silver bullets of the energy transition [92]. Such policy agendas have the potential to accentuate support policies for vulnerable groups or energy efficiency investments that sometimes are overlooked within a greater scheme of transition discussions.

In terms of fiscal measures for the energy transition **(**Q12**)**, stakeholders have considered *green taxations* primarily focusing on carbon taxes targeting sectors not already included in EU Emissions Trading System (EU ETS), then those within ETS and on fuels prior to taxes on NOx, SOx, diesel and/or electricity (Figure 10). Taxations on the electrical system per se, appears as the least preferred option, as Spain´s electricity bills are one of the highest in Europe, the average electricity bill growing by 76% between 2007-2013 [93]. However, is it also important to bear that there may be synergies or negative interactions between different instruments such as that of ETS and renewable deployment [94], so policies should not be planned out in isolation.

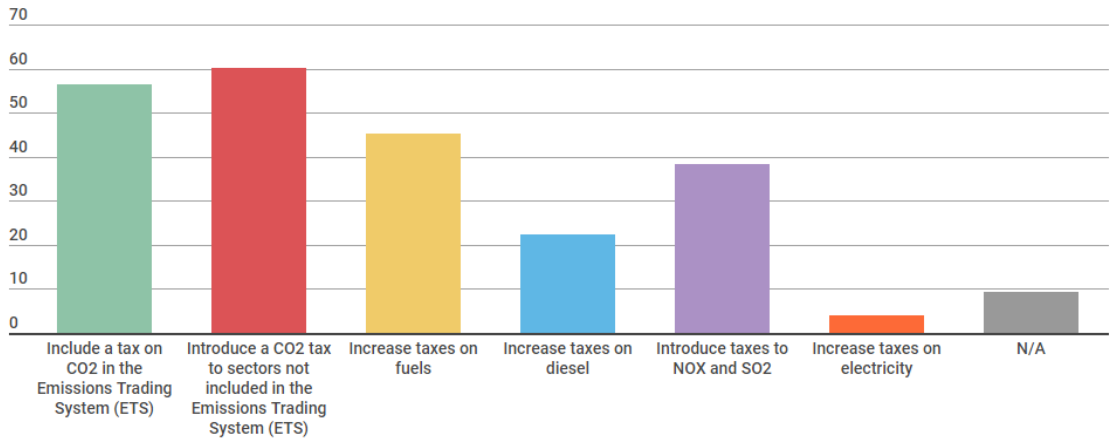

Figure 10. Green taxation schemes and levels of prioritization (as defined by Stakeholders) (Q12 of Survey)

Green tax reforms may also provide an opportunity to earn a double dividend [95]: asides from protecting the environment as a public good and making the polluters pay for

damages, environmental taxes may raise revenues that can be used to reduce existing tax distortions. They do not only improve the environment – the first dividend, they may also contribute to a reduction of the overall excess burden of the tax system – the second dividend. Stakeholders have indicated preference to use revenues from environmental taxes **(Q13)** to finance energy efficiency and renewables (67% of the stakeholders) (see Figure 11) or to compensate households at risk of energy poverty (14%). These results show the relevance of a fair energy transition discussion on the agenda in Spain.

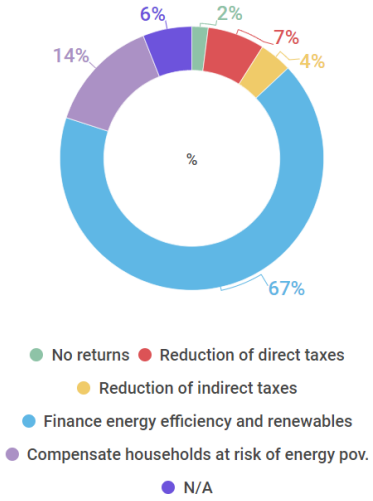

Figure 11. Stakeholder preferences over resources generated by environmental-energy taxes (Q13 of Survey)

The energy transition innately involves transitions in overall socio-economic system that covers the transport, building and industrial sectors as well. Our listening phase (Q 17-19) has also captured policy measures in the medium term based on their *importance* (based on relevance for its value, magnitude and influence) and *probability* (possibility that this measure/policy is likely to happen) of occurrence (for a detailed analysis see Sorman et al. (2019)) [15]. Stakeholders incline toward seeing technological shifts (e.g.: electrification of vehicles, development of smart grids) and policy implementations (e.g.: limitation of traditional vehicles, regulation and rehabilitation of buildings) more likely and impactful in comparison to lifestyle changes (e.g.: changes in mobility patterns) or deep decarbonisation shifts (e.g.: promoting self-generation and consumption, electrification of industry overall). Although most policies rank high in terms of impact, policy shifts and techno-substitutes are more likely to take effect without necessarily implying deep transformational or radical changes to how the socio-economic system operates. This discussion can also be tied to rising ambitions but failing mechanisms of achievement, concurring with the recent widening emissions target gap [63].

3.5. Justice and Gender: More than "just" Keywords

Energy justice has emerged in recent years a conceptual tool, for integrating issues of justice, ethics, values, institutions, belief and power for eliciting different social framings of energy systems [96] as well as in practice in the recent Spanish transition debate regarding informed energy choices for decarbonisation strategies.

It has been well documented that a shift in energy provision and access to services are likely to have unequal distributional outcomes and potentially cause further social (in) justices [97] across different income groups, labour, race, gender as well as across

generations [98]. Principles of energy justice imply equitable shares of energy services that do not come at the expense of people, treating individuals and communities in a fair and all-inclusive manner.

Originally inspired from Sovacool and Dworkin (2015) [99] discussions with stakeholders under a just transition umbrella, have transcended to including a multitude of justice concerns ranging from: **transparency, reconversion, distribution, participation, compensation** and **plurality**. Here, energy justice has primarily served as an emerging niche in which new narratives can be brought in to seek alternative, more democratic and participatory agendas regarding energy systems and decision-making mechanisms. Stakeholders have refined justice criteria as: *transparency*: assuming more transparent mechanisms in decision making; *reconversion*: favouring industrial reconversion in the affected regions; *distribution*: bringing energy production closer to the place of consumption; *participation*: increasing the degree of citizen participation in the energy system; *compensation*: repairing damages caused to people, investors, society and nature and *plurality*: including a multitude of actors, voices and positions in decision making.

When given the option to select three criteria out of the six presented in terms of importance **(Q15)**, stakeholders have denoted issues of transparency as the foremost concern on making informed energy decision making choices (See Figure 12). The right to information results vital in terms of citizen´s rights for understanding and participating on energy related issues. Moreover, inferring from the listening process, stakeholders, mainly academics and the private sector, highlighted the need to introduce a clear and stable legal framework. Second, reconversion emerges as an important justice concern, selected namely by energy providers and the private sector, since they are the prime actors with workers and unions that need to steer the transition to cleaner and low(er) carbon alternatives. This result is clearly aligned with the political barriers as formerly identified for the eventual closure of coal and nuclear power plants (section 3.2). The Spanish government recently, settled a deal with union workers and miners, drafting up early retirement schemes, environmental restoration work in mining pit communities and re-skilling schemes for cutting-edge green industries under the umbrella of “just transitions” [69]. The third dimension is related to uneven allocations of risks and benefits of spatial factors. This not only concerns rural-urban provision and consumption patterns of current energy systems but also relates to an extension and expansion of new geospatial requirements based on a shift to low-carbon alternatives [100-102].

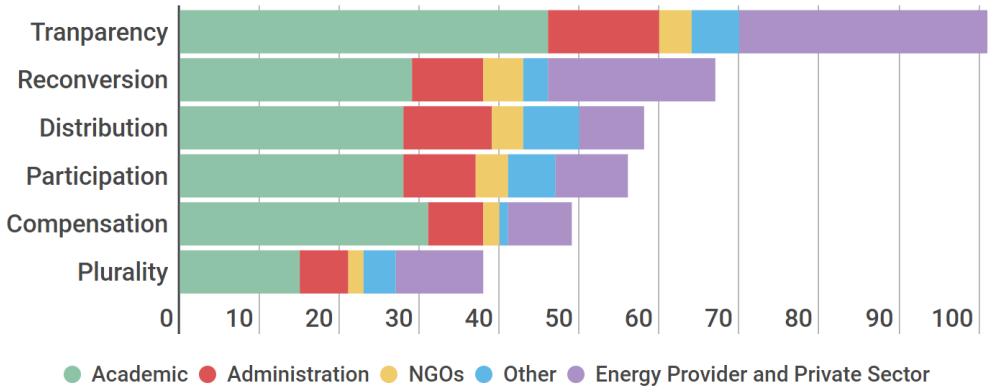

Figure 12. Important energy justice elements by stakeholder group (out of a max. of 3 selection criteria) (Q15 of Survey)

The factor of gender also emerges as a requirement that needs to be infiltrated into energy practices and solutions. Within the former government, in 2017, a group of 14 energy experts were convened to form a committee of experts to conduct a study on energy transitions and policy recommendations [103]. Although the members included a plurality of voices, four appointed by the Government, one by each parliamentary group and three by the unions [104], all members were male experts.

It has been contested that discourses on ecological and social values differ based on different manifestations of *masculine and feminine gendered* discourses, stemming from gendered discrepancy in value expression (105). Moreover, gender not only has a central role in the formation and response to environmental decisions, but different gendered groups also bear the loads of responsibilities differently [106]. Thus when dealing with energy transition issues at hand, whether it be from the perspective of problem conceptualisations or deploying low carbon alternatives with a gender conscious vision; the issue needs to be tackled with great(er) attention rather than a mere reshuffling of the cards of the game.

When stakeholders were asked regarding their perception on the role of women in energy decision making in Spain **(Q16)**, results varied tremendously as perceived by both gender groups (Figure 13). While 26% of expert men believed that there was gender equality in decision making, only 4% of women participating adhered to this statement. Conversely, 51% of women systematically believed that the current energy transition model excluded the role of women in decision making.

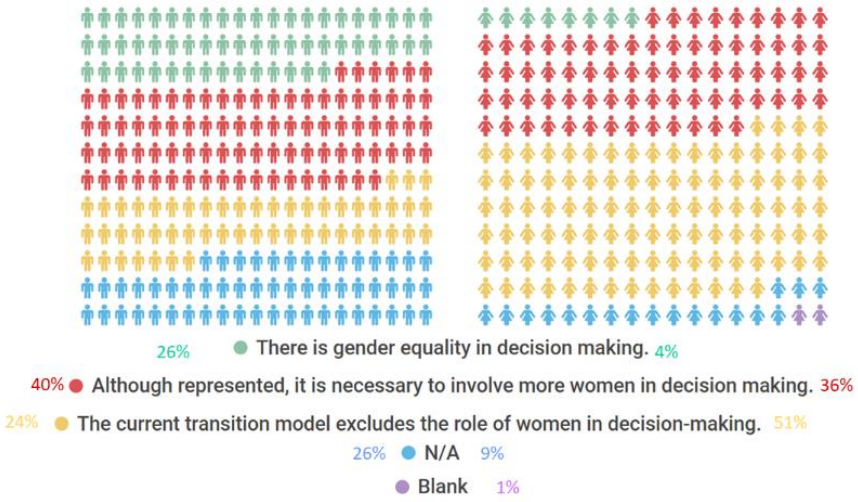

Figure 13. The perception of the role of women (by both men and women) in energy decision making in Spain (Q16 of Survey)

Results of gendered perceptions on the role of woman in decision making brings up questions on the degree of women's presence and the inclusion of their narratives in transition scenarios or whether viable new paths can be created when more gender sensitive understandings are accommodated in overall decision making processes.

4. Discussion

Primarily, we observe that the energy transition concept in itself is value based and highly politicized. Transition strategies and aspirations are constructed on agendas of the parties in power and political structures [107] in turn shape and attract different groups of actors and their vested positions. Energy transitions and policy cannot and should not be seen in isolation from the political climate in which it is embedded both at the national or the regional level. Therefore, it is important to acknowledge the temporalities of political phases and their respective impacts on energy and climate policy. The sun tax experiment was a mere example in how transitions can be hampered with a lack of ambitious policies and visions. Several authors have also drawn attention to the passive engagement of actors in the Spanish transition debate until recently in comparison to other transition plans like the Energiewende in Germany [108] and stress the importance reviving the Spanish "transición energética" from a more collaborative and active discursive space based on deliberation [109].

Currently, in 2019, the new ministry of Ecological transitions is playing a decisive role in setting out 2030 and 2050 plans. This, is not only is reflected through rising ambition levels as portrayed by the stakeholder engagement process but also emerges in Spain's performance within the larger EU28 setting. Recently, the European Climate Foundation Study, ranked Spain's national plan as the highest of the 28 Member States, based on adequacy of national targets, comprehensiveness of the policy descriptions, as well as quality and inclusiveness and participation [110]. The European Commission however, has called for *"more effort…stronger ambition, more policy detail, better specified investment needs, or more work on social fairness"* [111]. Similarly, on the global scale, NDC ambitions need to ratcheted, by threefold to achieve the well below 2°C goal and more than fivefold to achieve the 1.5°C goal [63]. We believe that the results, as presented here, can complement efforts of ratcheting ambitions and stepping up of policy goals and actors on the forefront of change.

Bringing in diverse viewpoints can help deliberate over criteria of equity and representation, serving the basis for constructing socially robust pathways and integrative support [112] in the future design of energy and climate policies. As such, we can learn and lean toward action even when interests diverge, based on principles of inclusive and reflexive transition ambitions [113]. In this way we can also articulate the different positions and agendas rather than ignoring or marginalizing voices that can – at times – be overlooked. No single perspective or vantage point [114] alone is adequate to understand the multiple meanings and challenges of what a low-carbon energy transition may entail.

On the continuum of stakeholder positions, we observe differing views. At times ambitions are approached with caution due to lessons learnt from past experiences, based on regulatory changes or procedural injustices - that have acted out as 'deal-breakers' hindering the rollout of renewables. Some actors, such as large scale energy providers and investors have tightened their grip on new policies and practices with discretion and prefer that Spain follows other central countries in the transition rather than lead the transition itself. At times motives perpetuate potential vested interests at play, maintaining the business as usual, hindering the overall societal quest for achieving climate targets.

The other end of the spectrum, traditionally lead by NGOs and local scale energy providers, actors are galvanizing ambitions further with successful qualitative and

structural changes from the bottom up: from grassroots initiatives and social movements. The rise of renewable energy cooperatives has pushed forth a societal agenda in the transition, brining principle elements of justice concerns directly at interplay with micro and macro level politics. The evolution of renewable energy cooperatives, as in the case of SomEnergia, has raised co-learning opportunities toward sustainability and social justice [65]. Such initiatives not only strengthen efficacy of collaborative efforts but also provide more visibility and communicative power of successful collective action.

Although our analysis has been limited to expert stakeholders, civil society has also been engaging with alternative forms of mobilization around initiatives such as the Platform for a New Energy Model (Px1NME, Plataforma por un Nuevo Modelo Energético). This platform founded in 2012, has been in a collaborative effort in citizens decentralizing production and management, contracting electricity of 100% renewable origin in favour of the energy transition [62, 115]. Similarly, recent efforts have consolidated a Network of Women for an Ecofeminist Energy Transition (La Red de Mujeres por una Transición Energética Ecofeminista (RMx1TEE)) [116] pushing for a change in the identity and vision of the energy sector, acting as a transformative network with an inclusive and proactive agenda for an ecofeminist transition.

5. Conclusions

Energy transitions involve high degrees of uncertainty as well as varying societal stakes, making it vital to include a multitude of narratives as expressed by different stakeholders - a process also fostered by the Talanoa Dialogue. However, a diversity of perspectives also come about with embedded sets of underlying values and interests with different priority agendas in the construction of transition narratives.

Our research shows the importance of broadening the discussion of energy transitions beyond technological choices, dialoguing with different stakeholders for continued conversations on how transitions are to come about. We have engaged with an array of expert stakeholders, as a transversal component of our research, emphasizing that the process in itself was a core goal of the research. The process has covered *the scoping* (including a multitude of actors), *the listening* (co-creating with stakeholders through interviews), *the understanding (*extending to incorporate perspectives through a survey reaching to over 200 people), *the participating* phases (hosting a workshop of over 100 participants to increase robustness, opening space for reflections and handing back the results) to summarize several of the *central debates* emerging from the manifested answers. This has been an attempt to flesh out inclusivity of diverse knowledge domains, as well as discussing socially relevant themes with and for stakeholders. Doubtless however, dealing with complex challenges also implies going beyond expert communities and engaging with lay citizens for ownership of science for real transformative action.

The discussion themes have included temporalities of the transition heading for the mid-term 2030, or longer term 2050 objectives as well as anticipated ambition levels of decarbonisation within the foreseen timeframe. Lessons learnt from regulatory changes as expressed by stakeholders have immensely affected the rollout of renewable energies across the last decade in Spain. New regulations fortunately have given the green light for renewables to spread out once again, while self-consumption implies future democratization over control of resources, a reoccurring theme, if not more, important as production and consumption of energy.

The end of coal appears imminent, as close as 2025. Main barriers for their closure appear as territorial politics followed by state politics and social and economic factors. Turning away from coal, has also been supported by a major energy transition deal signed by workers and unions and the recent government that is to foster such a transition. This will not only assist in the reconversion of mining sites, primarily in the northern part of the country, but will also focus on re-skilling of workers for a just transition in socio-economic conditions. The future of nuclear seems blurrier. Yet the tendency of choices indicate closure of the five remaining nuclear power plants by the end of their lifetime once factors such as state politics and economic investments are settled. In terms of governmental politics regarding nuclear futures, the horizons have temporarily been fixed at 2028, when the youngest of nuclear plants operating in Spain complete their 40 years of acceptable lifetime.

Overall, growing consensus emerges on doing away with old and finding new patterns to embarking on a transition ruled by renewables. Future perceptions see a major decentralization and inclination towards smaller scale production schemes. This is most likely to be led by Solar PV, onshore wind, solar thermal (CSP), offshore wind and biomass in order of preference. Given public support, as supported by some stakeholders, geothermal and marine energies might also be a likely option as well. Fiscal policies for decarbonisation pathways may guide the way through taxes imposed primarily on non ETS and ET sectors, followed by taxations on fuels, SO_X and NO_2 and diesel fuels. As a response, resources generated by energy taxes should be redirected in propelling the further penetration of renewables as well as investments in energy efficiency. In this regard, households experience energy poverty is also a priority area of attention. Other sectoral policies, see technology shifts and policy implementations more likely to happen with an impact. Deep decarbonisation and lifestyle choices, although urgent, rank lower in probability of happening in the shorter term.

There is a light of hope with the new institutional arrangements placing **ecological** concerns at the heart of the issue. Decarbonisation policies have been prioritized as a must within Spain's future. How a transition *should* come about needs to be defined through engaging with social and political determinants and all involved actors on the frontiers of such transition pathways. One way forward is calling for a re-evaluation of ethical and gender aspects concerning transition proposals. Doing so will help transcend the lock-ins that impede transition, eventually giving way to bottom up, transparent and democratic agencies entering the game, acting as agents of change and being the carriers of energy justice.

As an end goal, what is clear is that we need to board all actors on the transition train: one that aspires for more ambition in a timely fashion.

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Appendix 1.

Questions as directed through the online survey:

1. **Should Spain carry out more ambitious decarbonisation processes than those set by European directives?**

   * Yes, the energy transition is a great opportunity for Spain.
   * Yes, but taking into account the possible costs associated with a more ambitious transition.
   * No, Spain should only achieve the objectives set by the EU.

2. **According to your criteria: What should the objective of renewables (%) in the final energy demand be by 2030?**

   * Less than 27%
   * At least 27%, in line with the European directive
   * Between 27 and 35%
   * Between 35 and 50%
   * More than 50%

3. **Indicate your degree of compliance with the following statement: "In 2050 it will almost be possible for renewables to represent 100% of the energy mix."**

   * Strongly agree
   * Agree
   * Disagree
   * Strongly disagree
   * N/A

4. **Indicate 3 (max) renewable technologies that will have <u>more weight in the final</u> demand in the next 15-20 years according to your criteria:**

   <u>Weight in final demand in 15-20 years</u>

   - Biomass
   - Wind (On shore)
   - Wind (Off shore)
   - Marine: Wave and Tide
   - Geothermal
   - Solar Photovoltaic (PV)

- Solar Thermal
- None
- Other

5. **Indicate 3 (max) renewable technologies that should <u>receive greater public support</u> in the next 15-20 years according to your criteria:**

<u>Weight in final demand in 15-20 years</u>

- Biomass
- Wind (On shore)
- Wind (Off shore)
- Marine: Wave and Tide
- Geothermal
- Solar Photovoltaic (PV)
- Solar Thermal
- None
- Other

6. **According to your criteria: What should be the role of the government within the energy sector?**

Less regulation **More regulation**

7. **In your opinion: What should be the role of government within the economy?**

Less intervention **More intervention**

8. **Regarding <u>coal-fired power plants</u>, indicate your <u>preferred option</u>:**

* Closure before 2025

* Closure after 2025

* Partial closure with a few plants at very low functioning

* N/A

* Continuation of activity

* Continuation of the activity conditioned to the implementation of CCS (Carbon Capture and Storage)

9. Regarding <u>coal-fired power plants in Spain</u>, according to your criteria, what is/are the main <u>obstacle(s) to their eventual closure?</u> *(You can select more than one option):*

* Economic
* Social
* State Politics
* Other (Specify)
* Territorial Politics
* Technological
* N/A

10. Regarding <u>nuclear power plants</u>, indicate your <u>preferred option</u>:

* Immediate Closure
* Closure by the end if its lifetime
* Extension of 10-20 years of lifetime
* Expand the number of existing plants
* N/A

11. Regarding <u>nuclear power plants in Spain</u>, according to your criteria, what is/are the main <u>obstacle(s) to their eventual closure?</u> *(You can select more than one option):*

* Economic
* Social
* State Politics
* Other (Specify)
* Territorial Politics
* Technological
* N/A

12. Indicate, according to your criteria, 3 (max) of the following fiscal measures to favour the energy transition:

* Include a tax (floor price) on CO2 in the Emissions Trading System (ETS)
* Introduce a tax on CO2 in the sectors not included in the Emissions Trading System (ETS)
* Increase taxes on fuels
* Increase taxes on diesel
* Introduce taxes on NOX and SO2
* Increase taxes on electricity
* N/A

13. Indicate your preferred option regarding the possible uses of resources generated by environmental-energy taxes:

* No returns
* Reduction of direct taxes
* Reduction of indirect taxes
* Finance energy efficiency and renewables
* Compensate households at risk of energy poverty
* N/A

14. In your opinion: Where should energy production systems evolve toward?

more decentralized - on a small scale through decentralized facilities

more centralized - to great scale through centralized facilities

15. Indicate 3 (max) of the following items that you consider important for achieving a just energy transition:

* Transparency: assume more transparent mechanisms in decision making
* Participation: increase the degree of citizen participation in the energy system
* Plurality: include a multitude of actors, voices and positions in decision making
* Distribution: bring energy production closer to the place of consumption
* Compensation: repair of damages caused to people, investors, society and nature
* Reconversion: favour industrial reconversion in the affected regions

16. Indicate one of the following statements regarding the equitable representation of women in decision-making about the energy transition in Spain:

* There is gender equality in decision making
* Although represented, it is necessary to involve more women in decision making
* The current transition model excludes the role of women in decision-making
* N/A

17. Regarding the transition in the Transport Sector, indicate, according to your criteria, the <u>importance*</u> and <u>probability</u> of the following Measures/Policies in the medium term (20-30 years).**

Definitions:

*** Importance: relevance for its value, magnitude and influence.**
**** Probability: possibility that this measure/policy will happen.**

	Important	**Probable**
	(selection from dropdown menu) Low/Medium/High/N.A.	
* Electrification of vehicles (implementing the electric car)		
* Reduction and changes in Mobility through: public transport, railway and carsharing		
* Increase taxes on fuels		
* Limitations of use and access of traditional vehicle in the cities		

18. Regarding the transition in the Building Sector, indicate, according to your criteria, the <u>importance*</u> and <u>probability</u> of the following Measures/Policies in the medium term (20-30 years).**

	Important	**Probable**
	(selection from dropdown menu) Low/Medium/High/N.A.	
* Development and promotion of smart grids		
* Regulation to improve the efficiency of new buildings and rehabilitation of buildings		
* Promotion of the Electrification of the Heating and Cooling (H&C) sector		
* Promotion policies of Self-generation and Self-consumption		

19. Regarding the transition in the Industrial Sector, indicate, according to your criteria, the <u>importance*</u> and <u>probability</u> of the following Measures/Policies in the medium term (20-30 years).**

	Important	**Probable**
	(selection from dropdown menu) Low/Medium/High/N.A.	
* Greater reuse (upcycling) and efficiency of materials and processes		
* Electrification of the low temperature industry (example: textile sector, processing of foods)		
* Increase the use of gas in high temperature sectors		

20. Gender:

* Woman
* Man
* Other

21. Age Range:

<25
25-35
35-45
45-55
55-65
>65

22. Highest level of education achieved:

* Primary school
* Secondary school
* Professional training
* University degree
* Postgraduate (masters, doctorate, etc.)
* None

23. Sector or type of company (you can select more than one sector):

* Energy provider
* Academic
* NGOs
* Administration
* Private sector
* Other (specify)

Appendix 2.

Correlation between ambition (questions: Q1, Q2 and Q3) and characteristics of stakeholders:

This table presents the results of a regression analysis to examine the relationship between ambition levels of different stakeholder groups as illustrated via Q1-Q3 *(columns 1-3)* as well as the construction of a dummy variable to look at correlations across extreme ambition positions (super-ambitious or pessimistic *(Columns 4 and 5)*) and factors of Age *(Rows 1-3)*, Education *(Rows 4-5)*[8] and Sector specificities *(Rows 6-19)* of respondents.

The table shows significance (low (p) value indicating that that changes in the independent variables correlate with shifts in the dependent variable) or insignificance (a larger insignificant (p) value suggesting that the variables show no changes with respect to each other).

A positive sign indicates that the variables are directly correlated (variables increase or decrease in parallel), a negative sign indicates an inverse correlation (one variable increases as the other decreases).

- Ambition 1 (1 – No, 2 –Yes with caution, 3 – Yes)
- Ambition 2 (1 - x<27%, 2 x-=27%, 3 - 27<x<35, 4 – 35<x<50, 5- x>=50)
- Ambition 3 (1 – Strongly Disagree, 2 – Disagree, 3- Agree, 4 –Strongly Agree)

The ***Super Ambitious*** range includes the following criteria: Q1 =3; Q2>=4; Q3>=3 meaning that: i) the transition is a great opportunity; ii) more than 35% of renewables can be achieved in 2030 and iii) they "agree" or "strongly agree" that 100% of decarbonization can be reached by 2050.

The ***Pessimistic*** range includes the following criteria: Q1 =1; Q2<=2; Q3<=2 meaning that: i) one should not be more ambitious; ii) less than or equal to 27% in renewables should achieved by 2030 and iii) they disagree with 100% decarbonization by 2050.

		lnAmbitious_Q1	lnAmbitious_Q2	lnAmbitious_Q3	Super ambitious	Pessimistic
					(Q1,Q2,Q3)	(Q1,Q2,Q3)
AGE	Old(er) +55yrs	-0.017	-0.039	0.055	0.067	0.065
	sig	0.806	0.582	0.450	0.339	0.353
	Young -35yrs	0.027	0.043	-0.121	-0.155	-0.078
	sig	0.707	0.545	**0.096***	**0.026****	0.267
	Mid. 35<x<55	-0.009	-0.007	0.059	0.082	0.017
	sig	0.895	0.923	0.416	0.243	0.812
		lnAmbitious_1	lnAmbitious_2	lnAmbitious_3	Super ambitious	Pessimistic
EDUCATION	University	0.101	0.068	0.089	0.244	0.012
	sig	0.153	0.332	0.222	**0.000****	0.865
	Postgraduate	-0.126	-0.109	-0.123	-0.276	0.000
	sig	**0.073***	0.120	**0.092***	**0.000****	0.998
	*	90 percent level of confidence				
	**	95 percent level of confidence				

[8] Sample survey respondents n=201 out of n=206 either have a university degree or higher

		lnAmbitious_1	lnAmbitious_2	lnAmbitious_3	Super ambitious	Pessimistic
SECTOR	Energy Provider	-0.255	-0.142	-0.080	-0.012	0.195
	sig	**0.000****	**0.043****	0.272	0.863	**0.005****
	Academic	0.138	0.138	-0.078	-0.066	-0.151
	sig	**0.050****	**0.049****	0.288	0.349	**0.030****
	NGOs	0.091	0.094	0.182	0.145	-0.069
	sig	0.195	0.181	**0.012****	**0.038****	0.325
	Administration	0.052	-0.008	0.110	-0.026	-0.042
	sig	0.460	0.915	0.132	0.715	0.547
	Other	0.011	-0.094	-0.055	0.028	0.074
	sig	0.872	0.180	0.453	0.691	0.294
	*	90 percent level of confidence				
	**	95 percent level of confidence				