

D3.3

Case study 3 report: Coopérnico - Renewable energy-driven cooperative, Portugal

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Executive summary

The overall objective of WP3 is to gather data from case studies and the multinational citizen consultation to respond to GRETA's goal of advancing the state-of-the-art knowledge on determinants that influence the emergence of energy citizenship. WP3 deliverables are presented on a case study basis focusing on (mostly) qualitative data collected by the case studies within the tasks of WP3, place that data into context and contextualise it with the outputs from WP1, WP2, and WP5. Moreover, the case study reports provide inputs for the synthesis of project results and the development of policy recommendations in WP6.

This deliverable (D3.3) summarises the findings from Case Study 3 of the GRETA project – which refers to Coopérnico, a national renewable energy cooperative fighting for a citizen-centric clean energy transition in Portugal (PT). Among other things, this deliverable identifies the existing citizen-centric energy policy landscape in Portugal, as well as the main actors involved in this Portuguese case study and their likely individual goals and specific behaviours towards a citizen-centric clean energy transition. This report also covers an analysis of the outcomes from the implementation of the 3-stage energy citizenship framework proposed in Deliverable D1.1 – namely, the drivers and barriers among those actors that (positively or negatively) influence the emergence of energy citizenship – considering for that different behavioural constructs, including engagement, outcomes, social norms, agency, and relational model.

The deliverable is structured as follows. Section 1 offers a detailed description of the case study and the actor and policy landscape it is embedded in; it also provides an overview of the case study design and methods. Section 2 provides a summary of the case study specific research results, and section 3 analyses these results in light of the energy citizenship emergence framework developed and documented in D1.1. Section 4 offers a discussion and reflection of the main analysis points before section 5 summarizes and concludes the case study's findings.

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Abbreviations and acronyms

AI:	Artificial Intelligence
APREN:	Portuguese Association for Renewable Energy
CEC:	Citizen Energy Community
CWD:	Cleanwatts Digital
DGEG:	General Directorate for Energy and Geology
DR:	Demand-Response
DSO:	Distribution System Operator
EDP:	Energias de Portugal
EGAC:	Entidade Gestora do Auto-Consumo (Self-Consumption Management Entity)
ERSE:	Energy Services Regulatory Authority
EU:	European Union
FIT:	Feed-in-Tariff
ICT:	Information & Communication Technology
PT:	Portugal
PV:	Photovoltaic
P2P:	Peer-to-Peer
REC:	Renewable Energy Community
R&D:	Research & Development
RED II:	Renewable Energy Directive
SEN:	Setor da Eletricidade Nacional (National Electricity Sector)
SME:	Small and Medium Sized Enterprises

1 Introduction

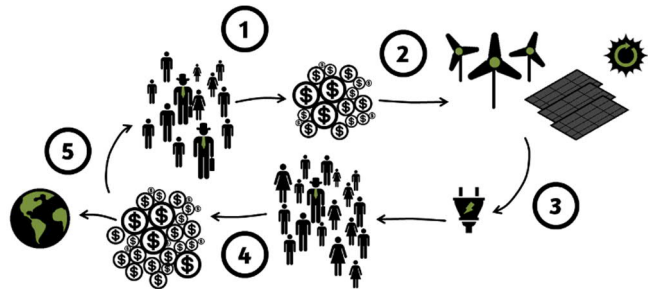
1.1 Case study

1.1.1 Case study description

This section provides a brief overview of the case study and the case study participants.

Coopérnico was born in 2013 and it is the first renewable energy cooperative in Portugal. Coopérnico's mission is to involve its members into the reshaping of the energy sector into a more renewable, socially just, and collaborative one. As a cooperative/social enterprise, Coopérnico generates social, economic, and environmental benefits through the sales of renewable electricity, the promotion of collective investments in renewable energy projects, and the sharing of benefits between its members, investors, organizations operating in the social economy, the broader society, and the environment, as per the scheme below:

- Coopérnico creates a large community of citizens and companies willing to contribute to a new energy, social, and business model.
- Coopérnico applies some of its savings towards collective investments in renewable energy projects, of which each member can own the share they want of this investment. Additionally, Coopérnico tends to prioritize local partners, incentivizing the creation of local jobs and promoting the transition to a local sustainable economy.
- The electricity that Coopérnico produces is integrated into the electricity grid, supplying families and businesses.
- Coopérnico's renewable energy projects (Feed-in-Tariff (FIT) or self-consumption) generate economic benefits, from the sale of the produced electricity, as well as environmental benefits with the production of renewable electricity and social value, either due to the close collaboration or the sharing of revenues with organizations operating in the social economy.
- Coopérnico distributes the benefits generated with society, investors, and the environment.



Today, Coopérnico counts with more than 2,500 members, including citizens, small-medium enterprises, and municipalities.

Joining Coopérnico today requires the purchase of at least 3 shares of equity capital worth 60 euros. By doing so, at Coopérnico customers also become co-owners of the cooperative/energy company. These bonds do not have fixed remuneration and can

only be remunerated if there is distribution of surplus resulting from the cooperative activity.

By becoming a member of the cooperative, their rights are: (i) to use the services and benefit from the advantages offered by the cooperative; (ii) to take part in the General Assembly by presenting proposals, discussing, and voting on the items on the agenda; (iii) to elect and be elected to the Social Bodies of the cooperative; (iv) to participate in the decision of the projects to be supported; (v) to invest in Coopérnico's projects; (vi) to participate in local or thematic groups; (vii) to participate in workshops, conferences and other events organized by Coopérnico.

In more detail, Coopérnico's members have the option of monetizing their savings through collective investments - something that has contributed to the democratization of investment in renewables. This model allows non-profit entities, citizens, and companies to produce their own renewable energy without the need to secure the initial investment. Until now, the cooperative has financed 32 collective PV projects, raising over 1.89M€ from collective financing campaigns in partnership with different social entities that provided physical spaces for the PV installations.

Additionally, since 2019 Coopérnico became an independent electricity retailer, being able to directly supply its members with renewable energy – today, it has +750 supply contracts with clients. The cooperative aims at supplying 100% green electricity by matching supply and demand; signing power-purchase agreements with additional renewable power plants; and buying guarantees of origin to ensure 100% renewable energy provision.

Coopérnico organises public informative sessions (open to its members and the wider public) to talk about the clean energy transition and how people can engage with it. It also participates in European-wide Research & Development (R&D) projects to explore innovative models for the decarbonisation of society. Additionally, it is actively supporting the creation of energy community projects in Portugal, as well as lobbying at national level to support the inclusion of citizens' perspectives into the transposition of European directives.

Not only that, but Coopérnico also organises Local Groups that intend to be a platform for all its members to actively participate in the collective commitment to the energy transition. On that note, the Local Groups represent Coopérnico's voice in the communities, allowing them to convey their concerns back to Coopérnico. Adding to this, it is also a way to make Coopérnico known throughout the country through its members, to allow cooperation between districts/municipalities, to ensure Coopérnico's regional representation, and to help identifying new members and opportunities for new renewable projects.

1.1.2 Relevant actor and policy landscape

This section aims to describe and distinguish the main actors involved in Case Study 3 (Coopérnico – a national renewable cooperative in Portugal), as well as hypothesise what their likely individual goals and specific behaviours towards a citizen-centric clean energy transition are, based on desk research and an unstructured interview with a Coopérnico representative. This was done in liaison with the conduction of the planned semi-structured interviews under the scope of the 3-stage energy citizenship framework developed in Deliverable D1.1, which is further detailed in this report. Not only that, but it also aims to provide an overview of the current policy landscape for a citizen-centric clean energy transition in Portugal, which is further explored in Deliverable D6.1.

The relevant actors for the Coopérnico study are the cooperative (as a business entity) and its members, policymakers at the national level (namely, the legislator and the regulator), and cleantech suppliers. The relationship among those actors (at the policy, technology, institutional, financial, environmental, and social levels) shape favourable or unfavourable conditions for a citizen-centric clean energy transition in Portugal and, consequently, for the emergence of energy citizenship. In view of that, those actors and the existing policy landscape in Portugal are further described below.

1.1.2.1 Relevant actors

Coopérnico (as a business entity): in the context of this case study, renewable energy cooperatives with a national reach represent fundamental actors driving energy citizenship through collective and proactive action towards a citizen-centric energy transition – namely through good practices, organized citizen initiatives and networks, political lobbying, and knowledge sharing.

According to a representative of Coopérnico, the main objective of the cooperative is to tackle climate change and energy poverty and promote a fair, socially just, democratic energy transition – in other words, to promote a citizen-centric clean energy transition. The cooperative's main target behaviours are: to orchestrate different financial schemes, innovative business models, and awareness raising campaigns for its members across Portugal. Furthermore, Coopérnico's specific behaviours are: to maximise energy efficiency; maximise individual self-consumption; accelerate and massify collective self-consumption schemes & energy communities; facilitate and incentivize new medium-sized PV plants (250 kW – 1 MW) in rural and urban environments (e.g., rooftops in parking lots, wastelands) to support small energy retailers and cooperatives; facilitate the purchase, sale, and trading of surplus renewable generation; improve the licensing process via auctions; incentivise renewable energy auctions for small energy retailers; mitigate the impact of large solar farms; incentivise participatory processes and transparency in the implementation of large solar farm projects (whenever inevitable); guarantee a 100% renewable mix for its members.

Coopérnico’s members: Coopérnico’s members are generally well-informed on sustainability, energy efficiency, and renewable energy. Their involvement with the cooperative can be seen as active from the perspective of energy citizenship, as they participate in collective, renewable-based energy production / consumption (geared towards societal economic and environmental benefits) and adopt home energy management systems that allows them to monitor and better understand their energy behaviours. Coopérnico’s vision, however, is to reshape the energy sector entirely, gradually increasing the number of citizens engaged in a more decarbonized and socially just society. For that, Coopérnico relies on spill over and network effects stemming from its growing customer base and national lobbying and community engagement activities. Thus, Coopérnico’s goal is to inform its members on processes that may lead already energy citizenship-active citizens into even bolder community action towards a citizen-centric clean energy transition, towards what could be considered an activism-like level of engagement (advocacy) – as per the GRETA energy citizenship awareness ladder with different engagement levels illustrated in Fig. 1.

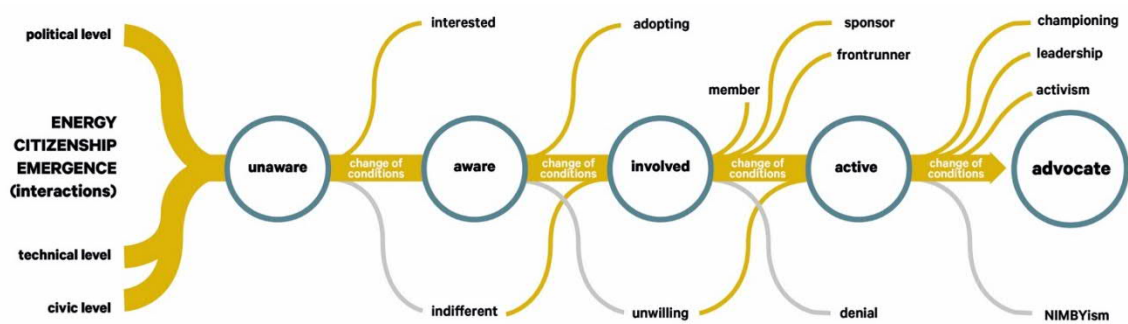


Figure 1: Representation of engagement transition outcomes along the GRETA’s energy citizenship awareness ladder¹

Hence, under the scope of Case Study 3, it can be said that the main objective of Coopérnico’s members is to join and proactively participate in Coopérnico’s activities in Portugal. Their likely individual goals refer to: (i) having a proactive role in the energy transition; (ii) energy bill reduction; (iii) having new sources of revenue streams; (iv) getting involved with a renewable-based energy consumption/collective production; (v) sense of belonging; (vi) sense of community/collectivity; and (vii) energy security. For that, their specific behaviours are: to purchase and co-own Coopérnico’s collective renewable self-consumption projects (i.e., become an investor); to become a volunteer in the different “working groups” (at the local and national levels), which aims to disseminate the cooperative activities across the country, identify

¹ Figure 1 has been reproduced with permission from the copyright holder Massari, M. (2020) (m.massari@unibo.it).

new project opportunities, and explore new fields of expertise or technologies; to assist the cooperative by offering help in line with your own area of expertise.

Policymakers: policymakers at the national level shape the policy and regulatory conditions that might steer or hinder citizen motivations and willingness to engage in energy citizenship, thus positively or negatively impacting their level of engagement and agency. Under the scope of Case Study 3, the main national level policymakers are the legislator and the regulator in Portugal – while the former is responsible for transposing European Directives into citizen-centric enabling legal frameworks, the latter is responsible for providing regulatory conditions and coordinating market dynamics for the implementation of these policy measures into practice. Namely, the legislator in this study is represented by the General Government of the Republic (Ministry of the Environment and Energy Transition) and the Regional Government of the Azores, while the regulator is represented by the Energy Services Regulatory Authority (ERSE).

Hence, it can be said that the policymakers' main objectives are to enforce the transposition of EU Directives in Portugal and promote citizen-centric enabling national legal frameworks that align with the lobbying played by Coopérnico through REScoop. Their likely individual goal is secure office and political agenda in the face of changes at the EU level.

Cleantech suppliers (e.g., Cleanwatts Digital - CWD): their main objective is to provide overarching Information & Communication Technology (ICT) solutions for the members of Coopérnico to enable the cooperative's operations across Portugal. Their individual goals include: financial profit; market position; entrepreneurship; climate change mitigation; and a fair, socially just, democratic energy transition.

1.1.2.2 Policy Landscape

In terms of the policy landscape, Portugal has introduced major modifications in the self-consumption regime of renewable electricity, guiding it towards the facilitation of Renewable Energy Communities (RECs), individual/collective self-consumption, and peer-to-peer (P2P) energy trading. This was done in the context of the transposition of the 2018 EU Renewable Energy Directive (RED II) into an enabling national regulatory framework in 2019, entitled Decree-Law No. 162/2019. This legal transposition was carried out in a partial manner to allow the responsible executive governmental agencies to gradually improve the national legal framework in view of best practices. In the context of a more progressive view on this matter, the Decree-law No. 162/2019 should be validated in close association with the aggregation of small-scale, residential flex-offers to create optimal RECs (from a performance-based perspective) in Portugal.

- **Renewable Energy Communities:** RECs are defined by Decree-Law No. 162/2019 as legal, for-profit, or not-for-profit entities, based on an open and voluntary membership of its members - who may be any natural or legal person, of a public or private nature, including SMEs and municipalities. Also, RECs must be autonomous from its members but effectively controlled by them. REC members

have the power to produce, consume, store, and sell renewable energy through renewable power purchase contracts, P2P energy sharing, or through all suitable energy markets, either directly or through aggregation, in a non-discriminatory manner. RECs are also fully responsible for imbalances caused to the national energy grid, being responsible for settling such imbalances or for delegating it to a market participant or its designated representative.

- Peer-to-peer Energy Trading: The referred Decree-Law defines P2P energy trading as the sale of renewable energy between market participants (e.g., final consumers, REC members, individual or collective self-consumers, independent producers, independent aggregators) under a contract with predetermined conditions governing the automated execution and settlement of the transaction, either directly between market participants or indirectly through a third market participant (e.g., an independent aggregator).
- Collective Self-Consumption: According to the referred Decree-Law, collective self-consumption schemes are a group of at least two self-consumers that own a renewable generation unit for self-consumption, organized in condominiums, apartment/house blocks, neighbourhoods, or industrial/agricultural units that are in geographic proximity. It also introduces a new, fully qualified entity to be appointed by the respective members of the collective self-consumption scheme, entitled Self-Consumption Management Entity (EGAC - Entidade Gestora do Auto-Consumo). This entity shall legally represent them before operators and administrative entities, as well as perform other tasks.
- Citizen Energy Communities: In 2022, the Decree-Law 15/2022 transposed two EU Directives (i.e., Directive 2019/944 on “common rules for the internal market for electricity” and Directive 2018/2001 on the “promotion of the use of energy from renewable sources”) – resulting in the first-hand inclusion of the theme of Citizen Energy Communities (CECs) in the Portuguese energy landscape. In general lines, CECs are governed by the same provisions associated with RECs, although with the following differentiation: (a) they can own, establish, buy, or rent closed distribution networks and carry out the respective management, in the terms defined in the referred Decree-Law; (b) they can produce, distribute, trade, consume, aggregate, and store energy regardless of whether the primary source is renewable or non-renewable.
- Demand-Side Flexibility: the aggregation of small-scale, residential flex-offers, including third-party participation for the balancing market or for the provision of ancillary services, is not yet possible in Portugal due to the lack of enabling regulatory frameworks. At present, only two forms of Demand-Response (DR) services are legislated in Portugal: (i) interruption contracts; and (ii) regulation reserve services, which are nonetheless still subject to many restrictions. In terms of a more progressive view on this matter, the energy policies that regulate interruption contracts and regulation reserve services should be modified to allow the aggregation of small-scale, residential flex-offers connected to low-voltage networks, and to make the minimum load mobilization capacity cap more flexible.

1.1.3 Case study research design

The aim of this section is to depict the different data collection methods and summarize the results of any case-study specific qualitative or quantitative data. This can include but is not limited to workshop results and any surveys and interviews conducted within the case study (excluding data or workshops that have been conducted for the purpose of WP2, 4 or 5 of the GRETA project).

Different data collection methods were conducted in Coopérnico under the contexts of WP1 and WP3.

Specifically, in the context of WP1 (T1.3), semi-structured interview protocols were designed to identify, quantify, and validate drivers and barriers among different actors within this case study, following the behavioural model for citizen engagement proposed in GRETA Deliverable D1.1.² The semi-structured interview protocols included different scales to assess each of the main constructs of the behavioural model (i.e., engagement, outcomes, social norm, agency, and relational model). This questionnaire was elaborated as a standardised measurement instrument to be applied in all 6 case studies encompassed in the GRETA project. The semi-structured interview protocols used in this case study is included in Annex 1.

In the context of WP3, an unstructured interview was conducted with a representative of Coopérnico for the development of the Background Research for Case Studies (T3.1), which served as a basis for the development of this report (T3.4), since it aimed to:

- Explore likely enabling effects of new technologies, market conditions, and institutional arrangements on energy citizenship in the case study.
- Scope the case study and identify in more detail all involved actors.
- Provide a background for comparison of the general wisdom from the scientific literature concerning drivers and barriers towards the clean energy transition with empirical results from the case study deriving from WP3 – i.e., what citizens and decision-makers perceive across the case studies.
- Place into context the existing policy options.
- Facilitate the cross analysis of the lessons learned from the case studies and the general wisdom from the scientific literature concerning drivers and barriers towards the clean energy transition in WP3 to WP6.

² Montalvo, C., Schlindwein, L., Ruggieri, B., Kantel, A. (2021). Framework for research on energy citizenship emergence structure and dynamics. D1.1 of the Horizon 2020 project GRETA, EC grant agreement no 101022317, The Hague, The Netherlands.

2 Research results

2.1 Case study results

The aim of this section is to provide an overview of the results collected within the case study (WP1 and WP3).

The research results are drawn from the implementation of the semi-structured interview protocols previously mentioned. Hence, this section aims to distinguish per actor what are: (i) their main individual goals and likely behaviours; (ii) positive and negative outcomes; (iii) social norms; and (iv) agency towards a citizen-centric clean energy transition; as well as provide a relational model that describes their relationship with each other.

2.1 Behaviours and goals per actor

By means of the implementation of the semi-structured interview protocols previously mentioned, Table 1 describes the main goals and likely behaviours of each involved actor towards a citizen-centric clean energy transition:

Table 1: Main individual goals and likely behaviours (present, near future, and distant future) associated with engaging in the clean energy transition.

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
CURRENT BEHAV.	<ul style="list-style-type: none"> - Co-financing Coopérnico's collective projects (crowdfunding) for financial gains (4% fixed gains, which is very attractive from an investment standpoint), but most especially for the feeling of doing something positive for the community or society at large. - Volunteering and participation in local working groups and technical groups (called GTIT). - Proactive participation in Coopérnico's R&D projects (e.g., become an energy mentor under the scope of the PowerPoor project) 	<ul style="list-style-type: none"> - Investments in decentralized photovoltaic production (UPACs) in a model of sharing savings for those who consume locally. - Involvement of citizens in such investments - allowing them to help the country on the energy transition. - Feed-in-tariff model, which is a very important support mechanism and has leveraged many energy cooperatives around Europe (PT abandoned it though), and not leave it in the hands of private companies. 	<ul style="list-style-type: none"> - The Legislation on the National Electricity Sector (SEN) (Decree-Law no. 15/2022, Jan 14) is focused on the empowerment of final consumers (in comparison with the previous legislation) - it gives a proactive and democratic role for citizens to take part in the renewable energy transition. - SEN also brought into perspective the creation of RECs and collective self-consumption. - SEN, despite not being specified, also addresses the topic of new user-centric system services and energy flexibility - another active way for citizens to participate in the energy transition (whether through the intermediation of an 	<ul style="list-style-type: none"> - Follow the evolution of themes - e.g., the issue of self-consumption and RECs in the regulation and legislation. - Promotion of webinars to spur conversations among different shareholders / entities to unlock problems and plan solutions. - Joint effort to understand what differs a REC from collective self-consumption. - Content creation on collective self-consumption and RECs (informative nature - making information 	<ul style="list-style-type: none"> - CWD developed the first RECs in the context of a regulatory sandbox in PT (with ERSE's formal approval) where we started to implement these concepts even without ready regulation that only appeared in 2019. - Before that, we were deeply involved with the user-centric energy transition through Cloogy and series of related projects with people becoming more aware of their energy use. Through the perception of

	<p>to assist people undergoing energy poverty).</p> <ul style="list-style-type: none"> - Helping the cooperative with their area of expertise. - Having the cooperative as their energy provider. - Collaboration in obtaining institutional clients (local parishes, City Councils, etc.) for Coopérnico for local renewable projects. - Proactive participation in the cooperative's General Assemblies. - Participation in local stands / exhibitions / workshops / public sessions to disseminate the cooperative's work in different localities. - Participation in Coopérnico's fiscal council. - Participation in other crowdlanding platforms (outside of Coopérnico but with ties to it). 	<ul style="list-style-type: none"> - Support governments and citizens, municipalities, and parish councils who want to create RECs. 	<p>energy aggregator or not).</p> <ul style="list-style-type: none"> - The Government of the Azores is ruled by a special legislation for autonomous regions - i.e., it has legislative autonomy unlike the continent. The local government has autonomy to adapt existing legislations to the specificities of its region (with the compliance of ERSE) - especially regarding tariff issues. - Citizens from autonomous regions have access to a regulated tariff equal to that of the continent (tariff convergence) - the regulator compensates this in the autonomous regions so that its citizens pay equal prices to that of the continent. This compensation (paid by the Regulator to the local energy producers) costs approximately 60 million euros per year for each autonomous region. That's why the legislator thinks RECs and collective self-consumption are essential in those regions to avoid this issue of tariff convergence. - ERSE has service quality levels for the continent vs autonomous regions (e.g., the Azores). The regional legislator negotiates with the regulator at the national level rather than with the national legislator. 	<p>accessible to the public).</p> <ul style="list-style-type: none"> - The regulator regulates the various activities of the electricity system. - The regulator has certain powers that come from the law linked to the energy market - so we establish rules for the functioning of this market, how agents participate, etc. Now, in this sense, when the RECs intervene in the market in the sense of collective self-consumption and other activities, they are under the application of our rules - the question is whether there are adaptable rules for the RECs or not. - Bringing people together to increase knowledge and access to technologies and investment are not direct aspects of the market - it is about funding and education, hence outside the reach of the regulator. ERSE only has an effective and direct intervention in what is implemented through the law on the energy market. - We are interested in knowing and understanding the change in energy consumers, but we have no role in it - unless the law somehow clearer comes to say that the citizens involved in these activities must be regulated by the 	<p>consumption, they start to make more educated decisions.</p> <ul style="list-style-type: none"> - Before the existence of RECs we were already helping citizens to change their behaviour through the efficient use of energy. That is fundamental. - At present, the journey is very clear. Now that we have already built the leading technology to integrate the citizen and the company (commercial citizen) in the energy transition through the structure of RECs where these different types of citizens are integrated, to leave the idea of individualised consumption and production and move towards a perception of community, collective.
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				<p>market.</p> <ul style="list-style-type: none"> - More recently with European and national legislation on RECs, there is a very clear and objective role to deal with RECs (collective self-consumption) - it is now legislated and detailed in the law and we have made a lot of contacts - webinars, rules, etc. We met with Coopérnico several times to understand how they want to organise RECs, to see what is possible or not, etc. 	
<p>NEAR FUTURE BEHAV.</p>	<ul style="list-style-type: none"> - Further elaboration of internal regulations to improve the operationalisation of the cooperative. - Further proactive participation in other Coopérnico's R&D projects. - Help Coopérnico launch new business models focused on individual self-consumption schemes. - Participation in sensitization workshops on RECs and collective self-consumption schemes. - Taking part in the creation of RECs and collective self-consumption schemes. - Purchase of excess renewable generation (Coopérnico as an energy aggregator). - Collective purchase of decentralised renewable units. - Keep Coopérnico as their energy provider (even though the dynamic pricing has spiked and is not economically feasible in view of offers of other big 	<ul style="list-style-type: none"> - Coopérnico in the short term wants to continue and consolidate the path of supporting local communities and becoming RECs - in the logic of bottom-up. This path is very defined and at the moment we have financial support to do so. - The next challenge is to diversify the energy production mix and deal with the social and environmental issues that these new sources of production bring. 	<ul style="list-style-type: none"> - The regulation that comes next proposed by ERSE will make a democratic energy transition more viable, as it is working on the self-consumption legislation (which already existed in the SEN). - Incremental approach - involving people in a Renewable Energy Community and making them able to exchange energy assets on a P2P basis. This is a process - it doesn't happen from one moment to the next - creation of legislative/regulatory layers - the energy flexibility part will come on a second stage. Governments work incrementally. Let's say we're going to create many pilot projects in this sense and involve the DSO and TSO so they can evolve in some way. 	<ul style="list-style-type: none"> - To start promoting citizens on the issue of energy flexibility - to develop services and a regulatory environment that can be done by consumers themselves. In this sense, the short-term adaptation of the regulation for pilot projects would be creating economically viable conditions to develop this service. - The regulator has a very clear responsibility in this regard - the regulator approves the market rules and these rules still only focus on large producers. And what you see is that industrial consumers and later residential consumers can play a role and this role is being made possible by technological development - electric cars for example and photovoltaic production that 	<p>The next transformation will bring ever larger RECs, and more information suited to their uses and consumption. The AI system will give even more accurate information about optimized collective consumption. through a set of algorithms working on the backend - that's where we're going to evolve - from an individual and collective perspective.</p> <ul style="list-style-type: none"> - Also, the use of flexibility in flexibility markets - multicriteria optimization that will look at everything that citizens do at the individual and collective level and how the system optimizes all this. This is not commercial yet - especially at the level of citizens and SMEs who are excluded at the moment.

	<p>providers, just because they value the objectives of Coopérnico).</p> <ul style="list-style-type: none"> - Partner up with Coopérnico to further build convergent projects outside of the cooperative. - Represent Coopérnico in local stands / workshops. - Create local desks to support local citizens in decarbonisation processes (with the support of local public administrations) 			<p>has become viable on a small scale. The consumer can provide these services as technology enables them to do so automatically. Adapt rules so that they recognize these new participants - this must be changed.</p> <ul style="list-style-type: none"> - There must be intermediaries (aggregators, RECs, etc.), since citizens have neither knowledge, interest, nor confidence to provide these types of very sophisticated services directly. There must be intermediaries (RECs or other entities) to carry out this intermediation with automation. ERSE has a role in disseminating and facilitating rules (it cannot force them to appear) - helping to try to avoid and eliminate the barriers for these entities to emerge. 	
<p>DISTANT FUTURE BEHAV.</p>	<ul style="list-style-type: none"> - Support in the reinforcement of local groups and the emergence of other cooperatives (higher capillarity). - Purchase of excess generation (Coopérnico as an energy aggregator). - Building up RECs and collective self-consumption schemes - difficulty to predict, but the tendency is to continue supporting the cooperative in view of their own intrinsic motivation towards a sustainable energy transition. 	<ul style="list-style-type: none"> - Diversify its sources of renewable energy because we know that the energy transition will not be made with just one renewable energy mode - a precise transition of all forms of production. - Reconciling renewable production with its own challenges (intermittence and environmental impacts). Coopérnico members are environmentalists and are not willing to invest in production with major environmental impacts - all this has to be put on the table and balanced. 			

2.2 Positive and negative outcomes associated with engaging in becoming climate neutral by 2050

By means of the implementation of the semi-structured interview protocols previously mentioned, Table 2 showcases the main positive and negative outcomes associated with engaging in the clean energy transition per actor:

Table 2: Positive and negative outcomes of engaging in the clean energy transition

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
OUT1	<p>Environmental benefits:</p> <ul style="list-style-type: none"> - Use green energy. - Reduction of the carbon footprint. - Get engaged with renewable energy and having access to tools to operationalise it. 	<p>Environmental benefits:</p> <ul style="list-style-type: none"> - Increase local renewable generation and consumption. 	<p>Environmental benefits:</p> <ul style="list-style-type: none"> - The new legislation (SEN) mitigates the environmental impact as it eliminates the need for centralized production - it entails the harmonization of decentralized assets across the country. 	<p>Environmental benefits:</p> <ul style="list-style-type: none"> - Energy efficiency in the network through the promotion of local self-consumption without the use of networks, and energy flexibility for a more efficient and local use of energy. 	<p>Environmental benefits:</p> <ul style="list-style-type: none"> - Increase local renewable generation and consumption.
OUT2	<p>Economic benefits:</p> <ul style="list-style-type: none"> - Purchase of excess renewable generation. - Financial gains from the co-financing of renewable projects (crowdfunding). - Reduction of the energy bill. 	<p>Economic benefits:</p> <ul style="list-style-type: none"> - Citizens own their energy company. 	<p>Economic benefits:</p> <ul style="list-style-type: none"> - In terms of economic benefits, it reduces our dependence on fossil fuels and fluctuation of energy prices (especially considering the war between Russia and Ukraine), creating greater independence and autonomy. - Citizens have more money available to spend on non-energy things (mitigating energy poverty); more autonomy; etc. - SEN also entails more decentralised energy, a circularity in the use of certain assets in people's homes (no need to add new things but use existing ones). 	<p>Economic benefits:</p> <ul style="list-style-type: none"> - To be able to incorporate a maximum amount of renewable production without major planning and reinforcement of the network structure. - Solving network congestion problems without strengthening the capacities of sites based on flexibility and greater incorporation of locally renewables. 	<p>Economic benefits:</p> <ul style="list-style-type: none"> - Reducing electricity costs - switch to using whatever cheaper solutions are on the market, instead of buying the fixed price of electricity.
OUT3	<p>Social benefits:</p> <ul style="list-style-type: none"> - Leverage (i.e., your personal idea reaching a large target audience) - Information and knowledge sharing - Access to trustworthy, transparent, and "neutral" information regarding the energy transition and how to engage with it (against green washing) (e.g., operation of the energy market, social involvement, investment programmes, renewable technologies, etc.) 	<p>Social benefits:</p> <ul style="list-style-type: none"> - Coopérnico only exists if citizens want to be part of it - therefore involving citizens in their own energy transition. - Energy literacy path. 	<p>Social benefits:</p> <ul style="list-style-type: none"> - The new legislation (SEN) ends up giving much more creativity and freedom to new dynamics, as it dismantles the traditional energy system that works in silos on behalf of a much more open energy system where citizens can participate (with certain rules) with an active role, together with new market agents. 	<p>Social benefits:</p> <ul style="list-style-type: none"> - Having many more participating agents (active citizens) in the energy transition. 	<p>Social benefits:</p> <ul style="list-style-type: none"> - Create an understanding between people for communal interactions. The management of a REC and the flexibility within a REC help citizens to work together to maximize value for the community and consequently for themselves. I think the RECs will bring the possibility of people working together in the energy area - citizen empowerment.

<ul style="list-style-type: none"> - Leverage on Coopérnico's work to educate and sensitize society at large as well as local communities - Knowledge learning on topics related with a sustainable energy transition from knowledgeable peers - Meet like-minded peers and build network to create further synergies with them in sustainable projects (even outside of the cooperative) - Disseminate Coopérnico to entities that are unaware of its existence - Help local associations, local companies, and local public entities to study solutions for decentralised and autonomous energy production - Taking part in the creation of RECs and collective self-consumption - Be part of something that leaves a positive legacy to the world, and contributes to the sustainable energy transition - Be engaged with the third sector - Fight energy poverty, create more comfort for people undergoing social vulnerability and leave a positive impact in their own communities / neighbourhoods - Partner up with Coopérnico to build synergies with convergent projects outside of the cooperative - Involving more people with decarbonisation processes and with Coopérnico - Having the cooperative as their renewable energy provider with clearly established socio- 				
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	<p>environmental goals (against big retailers)</p> <ul style="list-style-type: none"> - Promote wellbeing in their communities - Political engagement - Feeling useful 				
OUT4	<p>Challenges:</p> <ul style="list-style-type: none"> - Lack of time to conciliate the various activities offered by the cooperative and private matters - Coopérnico's growth pain (difficulty putting ideas / suggestions into practice) - Limitation in Coopérnico decision-making and operating structure - Lack of code of conduct, transparency, and homogeneous communication in advance - Lack of democratic participation, welcoming of new members, and a sense of belonging of members outside Lisbon - Waste of time in view of the multiple contrasting views of different members (problem with all collectives, and difficulty to reach consensus) - Cooperative doesn't know how to fully explore and use the know-how of its members - Need to further professionalise the cooperative's operating structure to support its growth - Isolated members (they do not know other members within their area in view of privacy data issues) - Energy price spikes (in view of the indexed pricing offered by Coopérnico as energy retailer) which are not financially attractive in view of other offers in the market (although many members kept 	<p>Challenges:</p> <ul style="list-style-type: none"> - Coopérnico could never have a large-scale solar project as the members will never support it (contestation). From a financial point of view, it is a disadvantage for Coopérnico, but from a social point of view it is very positive. 	<p>Challenges:</p> <ul style="list-style-type: none"> - Main challenges: networks, infrastructure, licensing from public entities. - Although SEN exists, things are not linear, and the energy network is not prepared for it. The transition cannot be done without an associated digital transition. The existing infrastructure is very conditioned to the old rules - and now it must change, given the multiplicity of players and flows and, in addition to the legislation, there must be rules and guidelines for infrastructure owners so that it has greater interoperability. - Involving citizens at a stage when much is not yet ready yet is difficult, but it is the reality - something could go wrong because the network is not ready. - The biggest challenge without a doubt is licensing - this is not only about energy; it has to go through a set of entities with different competences and visions. Being able to create an integrated and holistic view is hence fundamental and difficult due to that. - Another challenge is the speed in those processes - how to license quickly. - Another one is to be able to bet on the network infrastructure - transfer investments from centralized production to the capacitation of energy networks - it must be digital and interoperable, because if that doesn't happen, it won't work. - There must be people qualified to work on 	<p>Challenges:</p> <ul style="list-style-type: none"> - In short, the main challenges are - the start-up of this whole machine (adaptation of the regulator), initial impact, and citizen involvement. - We came from a model of a single integrated public company who did everything and who managed large production assets with great technical competence - then we moved on to several companies with smaller assets. Now we are talking about thousands or millions of new intervening agents (active consumers), which brings greater complexity, is a new system with enormous challenges - there is always resistance to change in the energy system, where we forget about this, but the main thing is the value of the energy system is its reliability - long before discussing price, whether energy is green, we are talking about reliability. And when reliability disappears, we feel it hard (running out of energy) as it causes huge restrictions on people's lives. So everything that is change challenges existing balances and having many agents becomes a challenge - operators, for example, have a lot of resistance to increasing the number of interlocutors - the 	<p>Challenges:</p> <ul style="list-style-type: none"> - How companies interact with customers - i.e., merge something technological with something essentially social and make it work together - e.g., when we talk about gamification, we have many variants and many ways to do it. The multi-relationships among citizens will transfer be transferred and modelled into the energy sector. - Regulation: need for more supportive framework - one thing is the regulation itself, and the other is its implementation. DGEG (i.e., The General Directorate for Energy and Geology) takes centuries to approve projects. E-REDES (i.e., the DSO) have difficulties in providing metering data as they should. Public and private institutions have to be quicker to react to these changes, and other changes when there's updates in the legislation. These entities cannot become obstacles or be too slow. The legislation must be ready, but the entities facilitating this transition must be quick to adapt as well. - Coopérnico has a set of super sensitive members, and the big challenge is not about them - it is rather with the people without an energy conscience, who use electricity in a passive way.

<p>faithful to Coopérnico regardless this situation)</p> <ul style="list-style-type: none"> - Services are sometimes not commercially attractive compared with offerings from traditional players - Lack of well-structured business models and operationalised best practices to put progressive ideas into practice (solutions must be built from scratch) - Asymmetry in technical skills and know-how on the operation of cooperatives among members might generate some fear on those that know less - Fear of "jumping in the dark" when joining the cooperative (no clear perspective on whether it will work or not - everyone has a positive feeling afterwards though) - Patience and humility to manage various opinions that are often not the most pertinent to Coopérnico's aims (internal democracy) - Need for alignment of Coopérnico's aims and objectives (renewable transition, social and environmental justice, circular economy, etc.) - It would be beneficial for Coopérnico to support the development of other cooperatives (higher capillarity) - Collective gains are more impactful than personal ones - Coopérnico opened the way in Portugal for the dissemination of ethical investments 		<p>these legislations - one thing is to be sensitive to the matter - as it was my case when I worked on the topics of collective self-consumption and RECs under the scope of SEN in the Government of the Republic.</p> <ul style="list-style-type: none"> - It is important to have public consultations and have different entities/companies explaining why they do something in a certain way. This is not the government's job only - those entities / companies (as the case of Coopérnico) must take responsibility to analyse the existing legislation and fight for changes. 	<p>opposite is simpler because they know how to deal with a system where they control everything. Technological challenges.</p> <ul style="list-style-type: none"> - Consumer involvement is also a challenge - residential electricity bills are around 30-40 euros per month. Any gain that the person may have to do something different is a minimum portion of this amount (2 or 3 euros of profit). How is anyone going to tolerate big changes for not-so-significant economic changes? 	
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2.3 Norms associated with engaging in the clean energy transition

By means of the implementation of the semi-structured interview protocols previously mentioned, Table 3 showcases the main dominant social norms per actor associated with their engagement in the clean energy transition:

Table 3: Norms associated with engaging in the clean energy transition.

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
SN1	<p>Motivation / support:</p> <ul style="list-style-type: none"> - High levels of intrinsic motivation to self-engage and engage others in sustainable behaviours (quote "volunteers are heart-driven") - Influence from local associations doing pro-environment work for the betterment of their neighbourhoods / villages (quote "when we volunteer to take part in collective projects, it becomes a commitment") - Cross-collaboration between universities and Coopérnico in public consultations, public awareness-raising sessions, conferences, scientific working groups, R&D projects, etc - Perception of a global cultural awareness towards a sustainable energy transition (external stimulus) - Feeling of being welcome / support from different local public administrations (energy agencies, city councils) - Members are advocates influencing other peers to participate, to a much higher extent than they being influenced by others (even though this is still present - positive influence 	<p>Motivation / support:</p> <ul style="list-style-type: none"> - Citizens and companies that become members 	<p>Motivation / support :</p> <ul style="list-style-type: none"> - Associations representing different sector of activities (e.g., APREN - Portuguese Association for Renewable Energy) put some good pressure on the Government so that things can evolve. On the contrary, the association of the decentralized production did not do much work in this regard. - The orders themselves (engineers, architects) also exert pressure. - From the individual point of view, it is also felt, but I think that the government's approach must be based on a collective logic. The pressure cannot be done for the benefit of a certain group or sector - it has to be transversal to a larger group of stakeholders. 	<p>Motivation / support :</p> <ul style="list-style-type: none"> - In the large share of market agents, there are few who go a little further trying to push these new mentalities and services - the main ones are the technology producers because they want to sell their solutions - very immediate incentive to survive in this market. - We also listen to consumers a lot (e.g., through consumer protection agencies). This is the recipe for everything. In this particular case, these webinars ended up giving the opportunity to hear who wants to do these projects - they had the opportunity to discuss directly with us, we have a mutual interest in what they are thinking, saying and regulation. We try to hear what the projects intend, what the needs and objectives of these projects are, in this sense we have spoken with the promoters of the projects and with the academic environment (who consult on these projects and have participated in the more theoretical parts of the models to be chosen). 	<p>Motivation / support:</p> <ul style="list-style-type: none"> - Cleantech companies are the ones who pushing all other actors. With the RECs we created in 2015, ERSE was able to see that they bring benefits - we are the ones who demonstrate the advantages to bring people together. We are very self-motivated and what motivates us the most are examples of other innovative projects (inside and outside the EU) and our competitors that will bring us interesting elements that force us to evolve. - Our clients too - e.g., in Italy we were forced to create a roadmap exercise because their clients there asking for information that we didn't have at hand in our platform. They want to progress to specific information in the app to further optimize their consumption. Our clients are often within their own niche and realizing their business and realizing what they can do, often get us to think about new functionalities and motivate us to accelerate our development.

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
	<p>from friends and family members)</p> <ul style="list-style-type: none"> - Feeling that society at large is yet to be sensitised to the energy transition (although climate change is not seem anymore as an issue raised by extremists only) - DGEG (The Directorate-General for Energy and Geology)'s simplified online processes - Local "chiefs" (caciques locais) can exert some political influence on people from local villages 				
SN2	<p>Opposition / Dependency on others:</p> <ul style="list-style-type: none"> - Coopérnico's operational and decision-making structure does not encourage members to contribute (feeling of being left out) 	<p>Opposition / Dependency on others:</p> <ul style="list-style-type: none"> - Opposition is felt by the rest of the world. I think nobody is seriously with decision-making power (government, regulatory entity, other companies in the sector) is interested in cooperatives entering the energy model with their democratic management model, otherwise we would already have legislation in PT that would promote the development of energy cooperatives on an equal footing with traditional market players. 	<p>Opposition / Dependency on others:</p> <ul style="list-style-type: none"> - All environmental associations are dramatic and have been the biggest blockers to the energy transition - they lack a holistic view to the problem in stake. They don't realize that in order to integrate renewables there has to be an impact on the landscape. Either you assume that this will happen, or you live in a utopian and unreal world - there is no transition without an environmental impact (even a minimized one) - which is nonetheless better than burning fossil fuels. And with the power they have, if there are no legislators with purpose, they can inhibit a number of processes. - Legislators do not act of behalf of a single entity or sector - they must have a holistic view. The main objective is to determine if actions are possible and, if not, prohibit something specific. What happens is that 	<p>Opposition / Dependency on others:</p> <ul style="list-style-type: none"> - Network operators offer some resistance to change - there is openness to accepting new things but this is something that needs to be encouraged. 	<p>Opposition / Dependency on others:</p> <ul style="list-style-type: none"> - DGEG and E-REDES as already mentioned.

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
			<p>the legislation lags behind the state of the art - the legislator actually tries to accommodate within regulatory frameworks what is emerging in the energy field. As the development of the energy regulation is happening in a fast-paced way, the legislation must be reviewed every 2-3 years to accommodate what is emerging in the state of the art. For this, either a working group is formed with several different stakeholders involved, or a public consultation is created for all stakeholders, so that they can contribute with the legislator in the analysis and accommodation of what makes sense or not. Often stakeholders evaluate and send contributions regarding their own specificities, while the legislator needs to have a more holistic view (always in view of benefiting the society, whilst taking into account European Directives).</p> <p>- The other problem is that the transposition of European Directives is not the same in all countries - there are no equal rules in the Member States - and it does not last in the long term in view of fast-pace of developments.</p>		
SN3	<p>Opposition / Dependency on others: - DSO's lack of communication</p>	No data	<p>Opposition / Dependency on others: - Energias de Portugal (EDP - the DSO) still wants to have the power to manage things - they do not want to share the management capacity</p>	<p>Opposition / Dependency on others: - We are on the side of the resistance in the sense that the legislator has gone ahead and has already defined a series of mechanisms to</p>	<p>Opposition / Dependency on others: - Our government could also put a spotlight on us to speed things up. Our Secretary of State pulls strings for the development of</p>

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
			<p>with other entities - they are not comfortable with this, with the weaknesses of the management of other entities - managing assets with new players, they end up putting a lot of pressure in this direction and the pressure is very well exercised - e.g., the reports that comes from EDP from the public consultations usually have +100 pages - EDP has the capacity to involve many people in these matters, unlike other entities. Also, they have political contacts as they are major players in the market. It is up to the legislator to know how to filter and protect what must be done, instead of accepting everything. This has been done in a balanced way.</p>	<p>promote this - it takes things forward. The regulator, on the other hand, has to go behind promoting these rules (essence of what the regulator does) there is no doubt about our role, but being a new and demanding subject, changing current practice takes time - to consider deciding by evaluating all oppositions - this is seen as a delay. However, we are aware of our role, and we try to make change happen - e.g., to create pilot project environments as flexible as possible so that it is really easier to make these rules more flexible in order to reduce the implementation time of the standards.</p>	<p>RECs. However, there is still a lack of emphasis and lack of importance on the essentiality of RECs for the energy transition. The entities that could help us speed up this process are not doing so. We don't have a government information office to create RECs in PT for instance - it makes no sense, whoever wants to do it has to start from scratch and do things on their own.</p>
SN4	No data	No data	No data	<p>Opposition / Dependency on others: - Citizens (they tend to react badly to the rules - they try to become free riders of the system - they want benefits / subsidies to make projects that are difficult to pay, at the expense of those who are not making this transition) - hence the regulator takes a step back to try to strike a balance. The system cannot be made for one at the expense of others.</p>	No data

2.4 Agency associated with engaging in the clean energy transition

By means of the implementation of the semi-structured interview protocols previously mentioned, Table 4 showcases the types of institutional (public policy) support,

resources, skills, knowledge, networks, etc., that are available to (or are mastered by) each actor to engage in the clean energy transition.

Table 4: Agency associated with engaging in the clean energy transition.

	Coopérnico’s members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
AG1	<p>Skills, abilities:</p> <ul style="list-style-type: none"> - Prior commercial / academic / professional / volunteering know-how on topics directly related with the energy transition - however this is not limiting as anyone without prior knowledge can also take part in the projects developed by Coopérnico (through the support of other specialized members) - people help with whatever they have in hands. - Linguistic knowledge (English). - Technical skills to understand how to get involved in the multiple activities offered by the cooperative. - Legal knowledge on existing legislations or on the operation of the energy market 	<p>Skills, abilities:</p> <ul style="list-style-type: none"> - Developing all the skills is a challenge – i.e., understanding what a photovoltaic system entails (installation, operation and maintenance), decentralized production. - Build trust where you have systems in place. - Learn everything (we have CRM partner companies) but we learn to read invoices, all the skills that the sector requires in the logic of a cooperative, always trying not to increase costs (make too many omelettes with few eggs) 	<p>Skills, abilities:</p> <ul style="list-style-type: none"> - First you need legal capacity – one legislation is always intertwined with another. Therefore, the jurist needs to be knowledgeable about the legal world to write legislation properly. - Then you need to have the vision – the politician has to have the vision of what he wants to implement and then do the pedagogy for the jurist who will translate this into enabling policies. - You also need a set of cross-sector technical skills when you write a diploma, because despite it being from the energy sector, you will not only have energy teams dedicated to it – you also need technical skills from the environment, architecture, engineering, etc. and it has to be in a language so those who are going to run projects need to understand how to implement it. - Legislative capacity that will translate all the lessons in a top-down manner. This is the basis for drawing a diploma. After being published to the general public, the various market players also need to make their contributions. After that, the technical team analyses it, discusses it with the politician (to understand whether it makes sense or 	No data	<p>Skills, abilities:</p> <ul style="list-style-type: none"> - Technological skills. - Financial skills (with regard not only to the management of our accounts but mainly to bringing investors who are interested in executing the energy transition). - The involvement with our regulators and politicians to raise awareness whenever possible. - Social sciences - we have the ability to bring the social component and how to integrate this with our users in a REC, so we can make a difference (e.g., creation of informal energy sharing networks). There are many tech companies without the social component.

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
			not), then the jurist sees if what the politician wants to do can be brought into the legislation.		
AG2	<p>Knowledge, information:</p> <ul style="list-style-type: none"> - Learn and get educated on the cooperative's long-term objectives, how it works and its various activities (renewable energy production and retail, services, co-financing scheme details, R&D projects, etc) - Coopérnico's newsletter/information kit is very informative to engage and educate members in its diversified activities. - Financial and accounting skills. - Every member should receive training and information on the principles within the Code of Conduct of Cooperatives. - Great availability of Coopérnico's technicians when there is any need. - How much time is needed to dedicate to each activity (hrs/week) 	No data	No data	No data	<p>Knowledge, information:</p> <ul style="list-style-type: none"> - Information on regulations. - Good practices (social sciences, we cannot be a purely technological company as we deal with people - we cannot be just a mini utility anymore as we are not exploring the full potential in this way, as we need to instil the sense of community in the energy sector). - What is being done in the market. - Research and development projects, etc.
AG3	<p>Financial means / time:</p> <ul style="list-style-type: none"> - Lack of time (members often participate on a volunteering basis, but people make time to things that deeply interest them). - Funds to become a member of the cooperative (one-time investment in at least 3 shares of social capital at a total cost of 60 euros). - Funds to further invest in the collective projects launched by the cooperative. - Funds to set up a Renewable Energy Community (however it is under study the possibility to refer to some sort of financing for those projects) - nonetheless members can still have a very proactive participation in Coopérnico without having to spend additional personal funds (apart from the payment to become a 	<p>Financial means / time:</p> <ul style="list-style-type: none"> - We don't need money as the renewable projects pay for themselves. - What we needed was a favourable legal framework to kick-start the first projects (as we did with the feed in tariff) – to provide the means for citizens to join Coopérnico's projects. - We do not ask for subsidies, we want a legal framework so that cooperatives can enter the market on an equal footing. - With proper financial resources we could hire someone to lobby, 	<p>Financial means / time:</p> <ul style="list-style-type: none"> - Usually, the team of the minister or secretary of state has to be able to carry out this work. It all depends on the size of the diploma – e.g., the SEN took 1 year from start to being published. It had 4 people in an office working 70% of the time and that was basically it for a degree of this magnitude. - Then there are situations (when there is no technical competence within the cabinet) it is necessary to seek strength and subcontracts. 	No data	<p>Financial means / time:</p> <ul style="list-style-type: none"> - Timewise, we have people and know-how within the company to carry our projects and, when we don't, we make partnerships. Deep down, we don't need much more than what we already have. - With regard to money, we are constantly bringing in new investments into the development of our platforms and features to improve the user experience of members integrating in RECs. - Regarding the implementation of RECs, our model is based on the following: an investee finances the development of a new REC, and we

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
	member) - Coopérnico is very inclusive in this sense	but this is not absolutely necessary for the transition to happen.			find and establish a contract for PV installations with anchor clients at zero capex. We as fund managers take the revenues deriving from the local production within the REC and pay the investors what is due to them. We have difficulty recruiting anchor customers in the implementation phase, that's why we partner with parish councils, firefighters, etc. to bring these people into the projects. Either we have the institutional support that helps and facilitates bringing these people to the RECs, or else we have to have people who carry out this action ourselves for us.
AG5	<p>Social network (e.g., for support):</p> <ul style="list-style-type: none"> - Legal/technical support from energy agencies and universities. - Coopérnico is often the only intervenient, but the installation of PVs from self-consumption for instance require the support of other businesses 	<p>Social network (e.g., for support) :</p> <ul style="list-style-type: none"> - Coopérnico relies heavily (unique in PT) on the network created by the federation that is based on ResCoop – this is our work network, that's where we understand what others do and how we can do it too. 	<p>Social network (e.g., for support):</p> <ul style="list-style-type: none"> - There is a lot of support from the sectorial associations (e.g., APREN) and from the orders (e.g., architects, engineers etc.). - The cabinets of ministers and state secretaries are not fixed things – i.e., people are appointed and rotate over the years and supposedly the cabinets need to have the skills to carry out their work. But it can happen that the assistants do not have competences and it is necessary to make subcontracts (for technical support) – which is not ideal but it happens. - In the photovoltaic auctions, for example, as they were complex auctions and it was the first time that PT 	<p>Social network (e.g., for support):</p> <ul style="list-style-type: none"> - The institutions (DGEG) within the government arm and network operators are essential pieces to support us in these matters because they are the ones who develop the system - without creating the rules together with them we end up not being well successful. - We also listen to consumers a lot (e.g., through consumer protection agencies). This is the recipe for everything. In this particular case, these webinars ended up giving the opportunity to hear who wants to do these projects - they had the opportunity to discuss directly with us, we have a 	<p>Social network (e.g., for support):</p> <ul style="list-style-type: none"> - Entities that help us - energy agencies where we carry these project, academia (through good practices), regulators, or for example in Austria specific offices in this area that help us to interpret the law and how we can adapt our business model for both the company and the customers. When this entity does not exist, it is much more difficult to have adequate information and make an accurate decision – we will have to pay tax companies and lawyers to understand how we implement these models. Information agencies for the implementation of RECs do not yet exist in PT

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
			<p>did it, there was no specialist in auctions so a team of lawyers was hired to perform this.</p> <ul style="list-style-type: none"> - The biggest existing enabling legislation in place right now is SEN. However, legislation only enables things – it is difficult to interpret for the common citizen. That's why it's important to have national energy agencies because the message reaches citizens in a simple message, as well as qualified companies that have the citizen as their final customer and so make efforts to simplify processes 	<p>mutual interest in what they are thinking, saying and regulation. We try to hear what the projects intend, what the needs and objectives of these projects are, in this sense we have spoken with the promoters of the projects and with the academic environment (who consult on these projects and have participated in the more theoretical parts of the models to be chosen).</p> <ul style="list-style-type: none"> - We also use European references a lot - what is being done in other countries, studies from other regulators, consultants, public institutions, more commercial studies, to try to learn from other examples. - At this point, there is a lot of information about a lot of things and there is not exactly a single or more concrete answer – things are just beginning and there is a more massive dissemination of these ideas. 	
AG6	<p>Circumstances / opportunity to explore alternatives:</p> <ul style="list-style-type: none"> - Need to rely on the interest and support of others (e.g., neighbours) to set up collective self-consumption schemes or RECs. - Need to rely on local public administrations to be able to set up local desks to help citizens in decarbonisation processes. - High media coverage on the energy transition, leading to higher societal awareness. 	No data	<p>Circumstances / opportunity to explore alternatives:</p> <ul style="list-style-type: none"> - You have the European directives with guidelines and the existing scenario in the country, and so you try to reconcile what you have and how things will evolve so it is essential to have this contact with players that know all the difficulties on the ground. 	No data	<p>Circumstances / opportunity to explore alternatives:</p> <ul style="list-style-type: none"> - Information agencies that do not exist in PT. - Transposition of European directives into enabling national frameworks.

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
	- The community-driven objectives instilled in Coopérnico is very attractive - something done by and for the community				
AG7	<p>Constraints:</p> <ul style="list-style-type: none"> - Coopérnico's operating and decision-making structure (limited capacity). - Information is sent without any time in advance, so members cannot plan ahead. - Need to further expand the portfolio of services provided by the cooperative. - Need to provide capacity-building workshops to help members to further engage with its activities. - The fact that general assembly meetings became online in view of the pandemic improved attendance by members outside of Lisbon. - Difficult to sensitize people outside of Coopérnico and bring people in (lack of awareness). - Islanded members (not knowing whether there are other members in your region view of data privacy issues). - Feeling that the Portuguese people are hard to be engaged (lots of ideological baggage) 	<p>Constraints:</p> <ul style="list-style-type: none"> - Legal – we do not have any legal support for the development of our activities. We must always be in direct competition with companies in the sector, as our values and objectives are different. 	<p>Constraints:</p> <ul style="list-style-type: none"> - Environmental organizations that are against what we are doing. - Network operators as they live in a world where they hold all the power, hence they do not view the democratization of the energy sector with a good perspective 	No data	<p>Constraints:</p> <ul style="list-style-type: none"> - In PT, DGEG and E-REDES as stated before. There should be no approval process, only information process about the creation of RECs. Very time consuming because DGEG does not have enough human resources to analyse all the projects that appear. Speeding up the approval is fundamental and then obviously the telecounting data – now we always have errors or incomplete information. There should be an API type schema and E-REDES must manage all these information tunnels. Definition of rules for implementation of clear forms, taxes, forms of constitutions, reports, etc.
	<p>Previous experience:</p> <ul style="list-style-type: none"> - Prior experience with decentralised renewable generation/home automation / eco-efficiency, etc. - Prior commercial / academic / professional knowledge or self-learning on topics directly or indirectly related with the energy transition. - Engagement with activities (e.g., local community associations, protests, volunteering programmes, environmental working groups, international R&D projects, worker's unions, National Council for the Environment 	No data	No data	No data	No data

Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
and Sustainable Development, Sustainable Energy Youth Network, etc.) that are directly or indirectly relevant to Coopérnico. - Prior environmental awareness. - Intrinsic motivation towards the energy transition. - Members see themselves as early adopters				

2.5 Relational model associated with engaging in the clean energy transition

By means of the implementation of the semi-structured interview protocols previously mentioned, the relational model presented in Table 5 showcases the interactions between actors.

Table 5: Relational model associated with engaging in the clean energy transition.

Actors	Citizens / the cooperative	Government (legislator, regulator)	Cleantech suppliers
Citizens / the cooperative		<ul style="list-style-type: none"> - Our relationship with the government is dubious - on the one hand, they say they want to support us, but on the other hand, they do nothing. We are invited to meetings with international energy agencies, but sometimes it seems that we are there just to show that we exist, but if we have to compete directly with private companies, it is a very difficult. - Relationship is purely institutional - paying for the bills. - Government is not transparent nor coherent - incomprehensive decision in the face of climate change. - Country is poorly managed. - Lack of response or heavy mistrust on the support of the government to achieve individual/collective decarbonisation goals. - Feeling that the central government backs up the energy monopoly in Portugal (against cooperatives such as Coopérnico - e.g., in the past, to become an energy retailer, there was a need for financial guarantees that would 	<ul style="list-style-type: none"> - Private companies enjoy working with us, as we want to pay a fair price for the service we hire. We try to work with local companies (real economy). - Openness to connect and partner up with small and medium-sized business to materialise individual/collective goals (PV panel installation, smart energy management systems, eco-efficiency, etc.). - Servitization of essential goods done by large energy companies (mistrust on them) - services are offered on a subscription based and telemarketing, always from the perspective of attracting and retaining customers - it is a very profitable, cosmetic, and commercial perspective. - Partnerships for collective purchases through the cooperative in the past did not work. - Small and medium-sized business often help citizens and are perceived as being pedagogic (from a technical perspective) and more attuned with the interests of citizens (client satisfaction at

		<p>economically atrophied Coopérnico).</p> <ul style="list-style-type: none"> - Feeling that politicians are often driven by personal interests instead of supporting the growth of society. - Economic interests overshadows Coopérnico's attempts to change energy policies (through public consultation processes, etc.). - Feeling that Portuguese politics is highly bureaucratic and the feeling is that the government do not put a lot of effort to improve that (high inertia). - Government has to facilitate the work of cooperatives, it has to be a relationship of freedom of expression and action, regulate and make the work that Coopérnico does more flexible. - Feeling that you cannot count on the government for the energy transition, hence you have to seek support from other entities. - Lack of involvement of citizens in the building of public policies, hence the government is not a driver of change. - Fiscal reductions on the acquisition of decentralised renewable units are in place (from 23% to 6% on the acquisition of PV panels), as well as the environmental funds (PRRs supporting 85% of the total investment in PV installations) which are great - but mistrust as to how long this will be in place in view of changes in the government, as well as a feeling that the government should support citizens even more to (e.g., in Italy the PRRs support 110% - evaluation of the purchasing parity power). - Trust in the work carried by small-scale local public administrations. - Citizen participatory processes are limited to the drive of progressive local public administrations - it is not something well structure across the country. - Even if local public administrations want to do something, they do not know how to operationalise it (need for guiding from the central government). - European Directives and the consequent transpositions into enabling regulations seem to be very beneficial for citizens, but it is hard to put them into practice until today. 	<p>their core) (non-conflicting relationship) - contrary to big suppliers that often have a commercial-oriented mindset and only want to push subscriptions and new products/services to citizens, regardless their personal needs.</p> <ul style="list-style-type: none"> - Business must offer interoperability with other systems to be attractive. - Support from retailers VS hiring a consultancy firm that charges 10x more (financial constraints). - Partner up with businesses that are attuned with their own personal beliefs and moral standards (e.g., having Coopérnico as their energy retailer against traditional retailers that offer services at a more attractive price). - Coopérnico needs to improve its communication with regards to partner businesses supporting citizens in decarbonization processes
<p>Government (legislator, regulator)</p>	<p>LEGISLATOR - In addition to the SEN, the government should create incentive systems to encourage</p>		<p>- The biggest existing enabling legislation in place right now is SEN. However, legislation only enables things - it is difficult to</p>

	<p>people to be more active in the energy transition.</p> <ul style="list-style-type: none"> - There is a framework of rules that comes from the law - regulation of self-consumption - specific rules for this micro-activity - renewable production at home. We also have the tariff instrument - when the regulator sets the prices of electricity, it is very concerned to define that energy costs adequately reflect the impacts of the activity, not only economic impacts but environmental impacts - and one way to do this is to determine price signals to the consumer so that they can act appropriately - that is, when we create different electricity prices night and day we are signalling that the system when it is more overloaded in the peak period uses more resources - it means more airlines flying over country, increased System maintenance, increased System capacity, etc. By correctly signalling costs with a structure that is sufficiently complicated to capture the wealth of costs, this makes the consumer able to better manage their consumption - this is not a transition merely of convictions (green transition etc) but also a transition with economic rationale - which gives more benefits because they are contributing to the common benefit, and only the Environmental rationale is very restricted because it is linked only to those who want to make a difference. Increase the number of people in the transition - the tariff regulation for self-consumption does that. The other ERSE regulations that define the rules for market participation and are equally important. <p>REGULATOR</p> <p>Many energy communities appeared before the European directive, so they are earlier and have broader realities than the law came to enshrine. Coopérnico promotes an investment cooperative function in renewable energies. What was at stake were individuals willing to invest their capital in facilities that were not their own, and boost projects, access to capital in those who will receive the installation, as well as break some barriers to the</p>		<p>interpret for the common citizen. That's why it's important to have qualified companies that have the citizen as their final customer and so make efforts to simplify processes</p>
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	<p>development of renewable energies - which represents the motivation of citizens and cooperative members. This in itself is an activity in which ERSE has no relevant role - who would have a role would be a financial regulator, as this model represents a financial activity.</p>		
<p>Cleantech suppliers</p>	<ul style="list-style-type: none"> - Through the role of EGAC (i.e., the legal entity responsible for the management of collective self-consumption and RECs), we can have a direct relationship with citizens, and through the tools we provide we are also able to do so. - We also have direct contact with them through social media, other platforms, etc. - People are hungry for this kind of thing. There is a lot of openness and reciprocity, but still very unexplored. 	<p>- Whenever we identify any critical blockage in the development of our activity and that has to do with regulatory or administrative issues, we get in touch with the government, schedule meetings, expose the problems and propose solutions. There has been this opening from their side.</p>	

3 Analysis

3.1 Behaviours and goals per actor

This section describes the societal goal and the behaviour and goals per actor based on the inputs for WP1.

This section describes the main goals and behaviours towards the clean energy transition (i.e., present, near future, and distant future behaviours - see Table 1) per actor. In summary, those are:

- Coopérnico's members' current behaviours mostly relate to their participation in Coopérnico's activities associated with renewable generation and collective purchase of decentralised solar plants (crowdfunding) or with activities outside of the cooperative but with direct ties with it (e.g., external crowdlending activities). Not only that, but it also relates to their (mostly voluntary) involvement in operational activities to keep the cooperative running. As for future planned behaviours (both near and distant future), it mostly relates to supporting the further operationalisation of the cooperative, as well as taking part in collective self-consumption, RECs, and energy flexibility (following the evolution of national legal frameworks).
- The cooperative's current behaviours are very much aligned with supporting its members, the local public administration, and the government in increasing decentralised renewable generation in Portugal. For that, Coopérnico follows a model that empowers citizens to be co-investors in those projects – hence increasing citizen empowerment by putting them at the heart of the clean energy transition. For both the near and distant future planned behaviours, it relates to promoting collective self-consumption, RECs, and energy flexibility (following the evolution of national legal frameworks), as well as diversifying the renewable generation mix of the cooperative (as well as tackling all socio-environmental issues brought forth by such diversification).
- The legislator's current behaviours relate to promoting and enabling new user-centric legal frameworks for citizen empowerment (e.g., RECs, self-consumption, energy flexibility, energy tariff compensation in the autonomous regions, etc.). As for future behaviours, it is associated with incremental improvements to existing user-centric legal frameworks to further promote a more democratic energy transition.
- The regulator's current behaviours relate to disseminating and facilitating market rules (i.e., making information accessible to the public through the promotion of webinars, public consultations, etc.; or providing regulatory environments for the development of pilot projects) – the specific influence of the regulator on citizens and cooperative only exists when it refers to market dynamics. As for future planned behaviours, it relates to the development of user-centric regulatory environments for the testing and validation of new user-

centric legal frameworks that are yet to be fully deregulated in the country (e.g., energy flexibility).

- Cleantech suppliers' current behaviours relate to testing progressive user-centric solutions prior to policy developments (i.e., frontrunners), as well as providing end-to-end, user-centric solutions (including technology, business models, engagement strategies, financing mechanisms, etc.) to support customers in the clean energy transition. In terms of future planned behaviours, those refer to the further optimisation of their software offerings in order for it to make more accurate and optimised decisions in view of the higher market complexity brought forth by user-centric models.

3.2 Positive and negative outcomes associated with engaging in GRETA

This section describes what and to what extent the different actors expect positive or negative outcomes from the engagement in GRETA in relation to themselves, society, the environment, and climate change. This favourable or unfavourable evaluation may arise from many factors that is clustered into social, environmental, and economic outcomes.

The analysis of positive and negative outcomes associated with the involvement in the clean energy transition (as perceived by different actors) can be subdivided in different categories. Specifically, pro-environmental outcomes represent a common perceived benefit by all involved actors – e.g., increased renewable energy usage, energy efficiency, and energy flexibility, which consequently reduces the environmental impact and the carbon footprint.

The perceived social outcomes were also similar among all involved actors – broadly speaking, it relates to the empowerment of citizens in the clean energy transition. Illustratively, the social benefits for the cooperative and its members related to the social network and intellectually stimulating environment promoted by the cooperative, which results in awareness-raising, improved decision-making capacity, access to transparent information, agency to mobilise others and tackle climate change / energy poverty, information and knowledge transfer, and a sense of community / belonging / usefulness. For the legislator and the regulator, social benefits are perceived from the perspective of the proactive role of citizens in energy markets and the new social and market dynamics that it entails. As for cleantech suppliers, social benefits relate to increased citizen empowerment in view of the collectivity mindset associated with RECs.

Similarly, with regards to economic outcomes, each actor perceives it in different manners. Illustratively, Coopérnico (as a business entity) and its members indicate many financial benefits from engaging in Coopérnico's activities, including financial gains from co-investing in collective photovoltaic plants, purchase of local renewable generation, and reduction of the energy bill in view of energy efficiency (which were

enabled by recent legal frameworks on the topics of RECs, collective self-consumption, etc.). For the legislator and the regulator, the economic benefits are perceived from the perspective of increased energy security and independence brought forth by renewables, as well as reduced network infrastructure planning, reinforcement, and maintenance in view of (renewable) energy usage optimisation. As for cleantech suppliers, economic benefits relate to lower energy prices (and consequent reduced energy bills for their customers).

Finally, challenges are also perceived differently by different actors:

- Coopérnico's members indicate that their main challenges relate to the current limitations in Coopérnico's decision-making and operating structure. That is because this limitation impedes members to fully engage in the cooperative's activities and, consequently, in the clean energy transition.
- The cooperative sees the inherent environmentalism of its members as a financial challenge since it limits the cooperative's commercial activities.
- The legislator and the regulator share similar challenges, often related to: (i) the existing energy grid infrastructure, which needs to become fully digital and interoperable; (ii) the licensing process from public entities, which needs to be improved and speeded up; (iii) the proper involvement of citizens in the energy transition, which could go wrong if all of the others aspects are not in place; and (iv) a more integrative view and participation of all involved stakeholders with those matters, which becomes a necessity in view of the paradigm shift brought forth by the clean energy transition.
- For cleantech suppliers, the main challenges are associated with the need for a better understanding of the Social Sciences & Humanities aspects of the energy transition (beyond technological aspects). That is because this expertise can help improve the commercial offerings for customers from an engagement perspective. Not only that, but the need for more supporting legal frameworks and improved licensing processes from the government are also considered challenges to them.

3.3 Norms associated with engaging in GRETA

This section describes how the different actors perceive their important referents (i.e., citizens, regulators, business, social, political, communities, shareholders, staff). All actors are generally guided by and within the limits of the dominant social norms and values. The assessment of the social norm intends to gauge the extent to which any form of social or personal norm regarding the engagement in GRETA is present (and how strong it is) in the contexts where citizens live. Here it is hypothesised that those actors with a high perceived social pressure will be more inclined / prone to engage in GRETA.

Regarding the analysis of social norms amongst the involved actors (see Table 3: Norms associated with engaging in the clean energy transition.), Coopérnico's members are deeply and intrinsically motivated to engage themselves and other peers

– reinforcing the initial assumption that they mostly represent advocates and defenders of the clean energy transition. They also feel great support from different stakeholders, often at the local scale (i.e., local associations, the local public administration, energy agencies, and academia), in contrast with their lack of trust in the DSO.

Coopérnico (as a business entity) feels only supported by its members (i.e., citizens and companies) as opposed to all other stakeholders with decision-making power (e.g., the government, the regulatory entity, other companies in the sector) – who are seen with mistrust given the continuing long-lasting, pending power imbalance between energy cooperatives and traditional market players.

The legislator's conduct is based on a collective logic (i.e., the accommodation of different perspectives into policymaking), which conflicts with the conduct of other actors who often advocate for their own benefits – in particular, environmental associations and the DSO. With that said, the legislator sees that associations representing different sector of activities and the orders themselves (e.g., engineers, architects) exert a positive influence in lobbying and public consultations.

Following a similar standpoint, the regulator's conduct is also based on a collective logic (i.e., the promotion of enabling legal frameworks for the benefit of different stakeholders), which conflicts with the conduct of other actors who often advocate for their own benefits – in this case, certain citizens (free-riders) and the DSO. On the other hand, the legislator sees that cleantech suppliers exert a positive influence on the evolution of regulatory frameworks geared towards the clean energy transition. Additionally, in view of the inevitable slow pace of their own work, the regulator is aware that others might view them as being on the side of resistance to change.

Cleantech suppliers also have a strong intrinsic motivation to push the clean energy transition forward (primarily because of market competition) and view their clients as strong supporters of their cause. They also feel that they exert a positive influence on the regulator. Nonetheless, cleantech suppliers feel resistance from the government and the DSO to develop their activities.

All in all, it can be said that an important social norm across multiple actors is the mistrust on the DSO (who is often seen as resisting the democratisation of the energy system). Also, in view of the slow pace of policy development and implementation, the government (mostly the legislator) is often seen negatively by other actors (namely citizens, cooperatives, cleantech companies) who are intrinsically motivated but do not feel supported to engage in the clean energy transition.

3.4 Agency associated with engaging in GRETA

This section describes the institutional (public policy) support and resources, skills, knowledge, and networks available to (or mastered by) citizens to engage in GRETA. For

this, it is necessary to define the capabilities and resources that are essential to undertake GRETA.

From the agency perspective (see Table 4), many valuable inferences can be made. At the level of the skills and abilities, the cooperative and its members, alongside cleantech providers, indicated the need for expertise in technical, financial, market operation, and legal matters to engage in the clean energy transition. Not only that, but social skills are also referred as equally important for different reasons (e.g., building trust between the cooperative and partners or furthering the engagement of the cleantech businesses' clients). From the legislator's perspective, this expertise is outsourced whenever there is no internal capacity to build enabling legal frameworks.

The same goes for the analysis of the dimension of knowledge and information. Knowledge and information on technical, financial, legal, and market operation matters are considered fundamental to engaging in the clean energy transition – along with continued learning of good practices stemming from academia and the market, as well as knowledge on the code of conduct of cooperatives in the case of Coopérnico's members.

In terms of social networks for support, it was often seen that external actors with technical / legal expertise provide guidance and support to different actors in the clean energy transition – e.g., energy agencies and academia supporting Coopérnico (as a business entity), Coopérnico's members, cleantech suppliers, and the regulator; or sectorial associations, professional orders (e.g., architects, engineers etc.), energy agencies, and cleantech suppliers supporting the legislator. However, such support (and consequent dependency) on external actors with technical / legal expertise could be reduced in case there were more institutional support from the government (e.g., through the creation of dedicated information agencies/desks to support cleantech businesses, cooperatives, and energy citizens in the clean energy transition). Also, Coopérnico is heavily backed up by the federation of cooperatives at the EU level, namely REScoop.eu³. Finally, governmental institutions and network operators exert some power in the relationship with the regulator, since they are the ones that develop and maintain the energy system.

In terms of circumstances / opportunities to explore alternatives, the creation of dedicated information agencies / desks (as previously discussed), the simplification of licensing processes, and the faster transposition of citizen-centred European Directives were common topics among various actors.

³ REScoop (<https://www.rescoop.eu>) is the European federation of citizen energy cooperatives, with a network of 1,900 European energy cooperatives and 1,250,000 active citizens in the clean energy transition

The main constraint indicated by Coopérnico's members is the cooperative itself, in view of its limited operational and decision-making capacity. In turn, the main constraints indicated by the cooperative are twofold: (i) competing private businesses, in view of their different values and objectives, and the lack of equal footing between them in energy markets; and (ii) the government, in view of the lack of provision of legal support, as well as the limited resources and capacity from the cooperative's side to institutionalise this relationship and make it more fruitful and permanent. Cleantech suppliers also share the view that the government does not provide legal support. Another constraint for cleantech suppliers is the DSO, in view of the need for simplification of processes. Finally, the legislator also thinks that the DSO represents a constraint, in view of their resistance to change. Not only that, but the legislator also see resistance from environmental agencies.

Finally, in terms of previous experience, Coopérnico's members indicated that any prior commercial / academic / professional background, self-learning, or engagement in activities directly or indirectly related with the clean energy transition is useful.

3.5 Relational model associated with engaging in GRETA

The previous sections describe the positive and negative outcomes, norms and agency aspects of the different actors associated with engaging in GRETA. Here we bring the relationship to other actors into the picture (with a focus on policymakers and business). We describe the dominant model that moderates the relationships between the different actors and the preferred model of interaction by each of them. This will give a picture of the model conducive to convergence to common GRETA goals in the case study. This is section serves also as transition to the next section.

When it comes to the relationship between the different actors (see Table 5: Relational model associated with engaging in the clean energy transition.), it is possible to draw positive and neutral / negative relationships, as well as reciprocated and unreciprocated ones. Illustratively, energy citizens and the cooperative (as a business entity) hold a positive, reciprocated relationship with cleantech business. Specifically, they hold strong ties with small and medium-sized business that share similar values and objectives, as they are seen as helpful and pedagogic from a technical perspective (i.e., non-conflicting relationship), as opposed to big private suppliers that often have a commercial-oriented mindset and try to servitize essential goods at the expense of citizens. On the other hand, cleantech business feel openness and reciprocity from energy citizens and the cooperative (as a business entity), holding direct relationships with them through the provision of dedicated tools and services to assist them in the clean energy transition.

A similar reciprocal relationship is felt between the regulator and cleantech businesses. In one hand, the regulator sees cleantech businesses as supportive of the evolution of regulatory frameworks, as they help bridging the interactions between the government and the society. On the other hand, cleantech businesses feel the regulator is open to

improving regulatory or administrative issues that hinder the development of their businesses whenever an issue is detected and raised by them. The only caveat presented by cleantech businesses is that these processes must be simplified and streamlined at the government's side.

However, an antagonised relationship exists between the legislator and energy citizens, the cooperative, and cleantech businesses. Whilst the legislator states that it tries to accommodate a citizen-centred view on the development and implementation of enabling legal frameworks (while still taking into account the needs from other stakeholders), energy citizens, the cooperative and, to some extension, cleantech businesses see that with dissatisfaction and mistrust. This is due to the slow pace of policy development, perceived governmental inertia, feeling that the government backs up the energy monopoly (against citizens and cooperatives), and lack of incentive mechanisms to support them in the clean energy transition. This aligns well with the findings from the analysis of social norms, as the governmental actors referred that since they must account for the multiple (and often contrasting) views and demands from different stakeholders, their approach towards matters of a citizen-centric clean energy transition often clashes with the individual expectations of different actors. However, it is important to note that this unidirectional relationship felt by energy citizens, the cooperative, and cleantech business with the government is only perceived at the level of the central government, as their relationship with the local public administration is seen in a trustworthy and supportive manner.

Finally, even though the point-of-view of the network operator (DSO) was not encompassed by this study, another antagonised relationship seems to be theirs with all involved actors. Specifically, it seems that there is a shared view on the DSO as resistance to change as to keep its monopoly of the operation of the energy grid – hence slow, irresponsible, or uninterested in a truly citizen-led clean energy transition. Contrarily to that, the relationship between all involved actors and local associations, the local public administration, and academia is seen as positive, since they support a citizen-led clean energy transition by providing legal / technical expertise, and good practices.

3.6 Asymmetries analysis across actors

The idea of asymmetries stems from the fact that there are different actors that are supposed to support and be involved in the energy transition. In fact, the behaviour definition demonstrates that for each policy goal considered, different actors perform different roles and behaviours that might have split incentives. The behaviours are complementary to achieve a superordinary societal goal that feeds from smaller behaviours and actions that should be performed by each actor. The asymmetry analysis will use qualitative components gathered during the interviews as well as quantitative ones indicating the level of engagement and the predispositions for each of the constructs that are included in the three stages model above

described. This section includes an overview across actors of different constructs: engagement (ENG); outcomes (OUT); social norms (SN); agency (AG); and relational models (RM).

Table 6 below presents an overview of the asymmetries on individual goals and likely behaviours, positive and negative outcomes, social norms, and agency towards the clean energy transition among the involved actors.

Table 6: Asymmetry analysis for the Coopérnico case study.

	Coopérnico's members	Coopérnico (as a business entity)	Legislator	Regulator	Cleantech suppliers
Goal / behaviours	<ul style="list-style-type: none"> - Participation in user-centric energy service models through the cooperative. - Support the further operationalisation of the cooperative. 	<ul style="list-style-type: none"> - Encourage a citizen-led clean energy transition through the promotion of user-centric energy services. - Diversification of the renewable energy mix. 	<ul style="list-style-type: none"> - Promotion of new user-centric legal frameworks for citizen empowerment. - Increment existing energy policies. 	<ul style="list-style-type: none"> - Disseminate and facilitate market rules for citizen participation in energy markets. - Provision of regulatory frameworks for pilot projects. 	<ul style="list-style-type: none"> - Test progressive user-centric solutions before policy developments. - Provide end-to-end, user-centric solutions to support customers in the clean energy transition. - Optimisation of their software offerings.
Attitude	<ul style="list-style-type: none"> - Environmental outcomes (CO2 reduction, energy efficiency, renewable energy use, energy flexibility). - Social outcomes (awareness-raising, improved decision-making capacity, access to transparent information, agency to mobilise others and tackle climate change / energy poverty, information and knowledge transfer, and a sense of community / belonging / usefulness). - Economic outcomes (savings and new revenue streams from user-centric services). - Challenges (limitations in Coopérnico's decision-making and operating structure). 	<ul style="list-style-type: none"> - Environmental outcomes (CO2 reduction, energy efficiency, renewable energy use, energy flexibility). - Social outcomes (awareness-raising, improved decision-making capacity, access to transparent information, agency to mobilise others and tackle climate change / energy poverty, information and knowledge transfer, and a sense of community / belonging / usefulness). - Economic outcomes (savings and new revenue streams from user-centric services). - Challenges (trade-offs from having environmentalists as members). 	<ul style="list-style-type: none"> - Environmental outcomes (CO2 reduction, energy efficiency, renewable energy use, energy flexibility). - Social outcomes (proactive role of citizens in energy markets; new social and market dynamics). - Economic outcomes (energy security and independence; reduced network infrastructure planning, reinforcement, and maintenance). - Challenges (the existing energy grid; licensing processes; involvement of citizens; integrated view on the clean energy transition). 	<ul style="list-style-type: none"> - Environmental outcomes (CO2 reduction, energy efficiency, renewable energy use, energy flexibility). - Social outcomes (proactive role of citizens in energy markets; new social and market dynamics). - Economic outcomes (energy security and independence; reduced network infrastructure planning, reinforcement, and maintenance). - Challenges (the existing energy grid; licensing processes; involvement of citizens; integrated view on the clean energy transition). 	<ul style="list-style-type: none"> - Environmental outcomes (CO2 reduction, energy efficiency, renewable energy use, energy flexibility). - Social outcomes (increased citizen empowerment in view of the collectivity mindset associated with RECs). - Economic outcomes (lower energy prices; lower energy bills). - Challenges (commercial offerings with strong Social Sciences & Humanities footing; existing legal frameworks; licensing processes).

<p>Social Norm</p>	<ul style="list-style-type: none"> - Intrinsic motivation. - Support from academia and local stakeholders (i.e., local associations, the local public administration, energy agencies, etc.). - Lack of trust on the DSO. 	<ul style="list-style-type: none"> - Intrinsic motivation. - Support from members. - Lack of trust in all other stakeholders with decision-making power (e.g., the legislator, the regulatory entity, other companies in the sector, etc.). 	<ul style="list-style-type: none"> - Conflict with individualistic standpoints from most stakeholders in the energy sector who advocate for their own interests. - Support from associations representing different sector of activities and the orders themselves. 	<ul style="list-style-type: none"> - Conflict with individualistic standpoints from most stakeholders in the energy sector who advocate for their own interests. - Support from cleantech suppliers, consumer associations, and academia. 	<ul style="list-style-type: none"> - Intrinsic motivation. - Support from the regulator, academia, and local stakeholders (i.e., local associations, the local public administration, energy agencies, etc.). - Resistance from the government (i.e., the legislator) and the DSO.
<p>Agency</p>	<ul style="list-style-type: none"> - Skills (expertise in technical, financial, market operation, and legal matters; social skills). - Knowledge and information (technical, financial, legal, and market operation matters; good practices from academia / the market; code of conduct of cooperatives). - Social network for support (energy agencies and academia; need for more institutional support). - Circumstances / opportunities (creation of dedicated information agencies / desks; faster transposition of citizen-centred European Directives). - Constraints (cooperative's limited operational and decision-making capacity). - Previous experience (prior commercial / academic / professional background; self-learning; engagement in activities related with the clean energy transition). 	<ul style="list-style-type: none"> - Skills (internal expertise in technical, financial, market operation, and legal matters, which is sometimes outsourced). - Knowledge and information (technical, financial, legal, and market operation matters; good practices from academia / the market). - Social network for support (energy agencies, academia, EU-level federation of cooperatives; need for more institutional support). - Circumstances / opportunities (creation of dedicated information agencies / desks; faster transposition of citizen-centred European Directives). - Constraints (no legal support from the government; competing private businesses). 	<ul style="list-style-type: none"> - Social network for support (sectorial associations, professional orders, energy agencies, and cleantech suppliers). - Constraints (resistance from the DSO and environmental agencies). 	<ul style="list-style-type: none"> - Social network for support (energy agencies and academia; need for more support from governmental institutions and the DSO). - Circumstances / opportunities (faster transposition of citizen-centred European Directives). 	<ul style="list-style-type: none"> - Social network for support (the regulator, energy agencies and academia; need for more institutional support). - Circumstances / opportunities (creation of dedicated information agencies / desks; faster transposition of citizen-centred European Directives). - Constraints (no legal support from the government; need for simplification of processes from the DSO).

When looking at present and future behaviours to achieve the common goal of the clean energy transition, similarities among the involved actors (i.e., the cooperative, the cooperative members, the legislator, the regulator, and cleantech suppliers) are strikingly evident – they all strive to either promote, enable, or participate in user-centric energy services. Their attitude towards that also share some common points – they all aim at achieving similar environmental outcomes (environmental impact and CO₂ reduction) and social outcomes (increased citizen empowerment and proactive involvement in energy markets). In terms of economic outcomes, while the cooperative, the cooperative members, and cleantech suppliers focus on increasing revenue streams and reducing the energy bill of citizens, the regulator and legislator focus on decreasing the costs associated with the energy grid whilst increasing energy security and independence. Challenges are also divergent – while the cooperative and its members focus on challenges associated with the operationalisation of the cooperative itself, the regulator, legislator, and cleantech suppliers share challenges associated with licensing processes and the pace of evolution of enabling legal frameworks.

In terms of social norms, the cooperative, the cooperative members, and cleantech suppliers are intrinsically motivated to engage in the clean energy transition, whilst the legislator and the regulator are careful about that in view of the need to embrace a holistic view on this matter (which often clashes with individualistic interests from different stakeholders). Due to that, the legislator is negatively seen by both the cooperative and cleantech suppliers, while the regulator is negatively seen by the cooperative only. Contrarily, however, the regulator and cleantech suppliers share a reciprocal positive relationship, while this is not so evident between cleantech suppliers and the legislator. Furthermore, all stakeholders share a feeling of support by local stakeholders (i.e., local associations, the local public administration, energy agencies). In contrast, the cooperative members, the regulator, and cleantech suppliers share the same feeling by academia. Also, all stakeholders share a lack of trust in the DSO (who is seen as resistant to the democratisation of the energy sector).

Finally, in terms of agency to engage in the clean energy transition, most actors indicate the complexity of engaging in the clean energy transition, which requires expertise in technical, financial, market operation, and legal matters (which is often outsourced in view of a lack of institutional support). This could be circumvented through the creation of dedicated information agencies to support stakeholders in the clean energy transition, as well as through the faster transposition of EU Directives. However, stakeholders generally do not feel support from the government.

4 Discussion and reflection

4.1 Discussion and reflections of case study results in light of policy recommendations

This subsection reflects on the previous analysis to offer a case-study specific assessment of the drivers and barriers for energy citizenship and main results of the case study activities that might be relevant for policymakers. It assesses the following:

- *What role can individual actors play in engaging with the energy transition? What kind of agency (i.e., individual power and space to be active) do they have? What options do environmental / economic / policy structures offer for agency (i.e., GRETA behaviour)? What options, limitations and constraints do actors face while engaging as energy citizens? Are there differences between types of actors?*
- *What are the main reasons actors engage in energy transition behaviour (i.e. drivers)? What are main reasons actors do not engage in energy transition behaviour (i.e. barriers)? Are there differences between types of actors? Which of these drivers and barriers are specifically relevant for policymakers and should be taken into account when designing policy frameworks on the local/national/regional level to foster GRETA behaviour?*
- *What role do social justice considerations play throughout the case study and for the actors involved? Please provide some examples for when they did play a role or for when they did not play a role and provide an assessment for why this is the case.*

Each involved actor in this study has a fundamental role in the clean energy transition in Portugal. Following a top-down approach, the legislator is responsible for the transposition of citizen-centric European Directives into enabling legal frameworks in the country, while the regulator is responsible for informing and clarifying the market dynamics brought forth by those enabling legal frameworks, as well as providing appropriate regulatory environments for the implementation and validation of pilot projects in practice. Furthermore, cleantech suppliers provide the solutions that allow citizens to proactively participate in the clean energy transition. Finally, the cooperative (and by extension, its members) lobby and fight for the democratisation of the clean energy transition as to have a level playing field with other traditional market players. Hence, even though all roles are intertwined, some power imbalances were made evident.

All involved actors strive for similar socio-environmental outcomes. Not only that, but many of them (e.g., the cooperative and its members, and cleantech suppliers) are intrinsically motivated to take part in the clean energy transition and have developed their own financial means to make it happen. However, on the one hand, they feel restrained at the operational level due to the inherently complexity of the clean energy transition, which requires technical, financial, market operation, social, and legal expertise (often outsourced); and, on the other hand, they feel restrained at the political level by stakeholders with decision-making power (i.e., the government, the DSO),

who are seen as slow, irresponsible, or uninterested in a truly citizen-led clean energy transition. On that note, the rationale given by governmental actors is that they must undertake a holistic view to those matters, which takes times and often clashes with the immediate individual interests of different stakeholders.

Following the abovementioned, those actors share a common vision – they all feel supported by academia and, at the local level, by local associations and the public administration (e.g., city councils, energy agencies) with technical, financial, market operation, social, and legal expertise associated with their socially-just decarbonisation activities – which nonetheless creates a level of support co-dependency between them. Not only that, but such support co-dependency exists in a non-structured, decentralised way. Hence, it would be ideal to have more centralised institutional support and guidance in place (namely, the creation of information agencies to support the implementation of RECs, or a faster transposition of EU Directives) in order to make the clean energy transition more structured and balanced for all involved actors – thus addressing existing energy justice and power imbalance issues.

Furthermore, the most antagonised actor seems to be the network operator (the DSO), who is seen by multiple different actors as resistance to change as to keep its monopoly of the operation of the energy grid, followed by the legislator who is seen as slow, irresponsible, or uninterested in a truly citizen-led clean energy transition as previously mentioned. At the governmental level, the regulator seems to hold a positive, reciprocal relationship with cleantech suppliers.

The following subsection assesses the following:

- *Within your case study, what role does being part of an energy community play for individual and collective citizen engagement in the energy transition?*
- *What role do policies play for individual behaviour in regard to energy transition activities in your case study? What policies and actors are relevant, which ones are not (and why)? What would policy incentives to promote energy citizenship behaviour look like? What policy level(s) is(are) the most relevant to promote energy citizenship? What would be your and your case study participants' main message to policymakers?*

From a policy perspective, the Portuguese energy sector should evolve to comprise the conceptualisation of RECs where its members can participate in the provision of demand-side energy flexibility services alongside P2P energy sharing and collaborative self-consumption. Not only that, but other configurations of energy communities (e.g., citizen energy communities) should be also deregulated. By doing so, it is possible to increase system flexibility through higher competitiveness in electricity markets, and to further incentivize joint investments in renewables through RECs, emphasizing on transparent and non-discriminatory integration of these new market players as expected by the European Commission. This is very much aligned with the individual views of the non-governmental actors involved in this study, who lobby and fight for the democratisation of the clean energy transition as to disrupt the existing power dynamics and have a level playing field with other traditional players in energy markets.

5 Conclusion

This deliverable (D3.3) summarises the findings from Case Study 3 of the GRETA project – which refers to Coopérnico, a national renewable energy cooperative fighting for a citizen-centric clean energy transition in Portugal. Among other things, this deliverable identifies the main actors involved in this Portuguese case study and their likely individual goals and specific behaviours towards a citizen-centric clean energy transition. This report also covers an analysis of the outcomes from the implementation of the 3-stage energy citizenship framework proposed in Deliverable D1.1 – namely, the drivers and barriers among those actors that (positively or negatively) influence the emergence of energy citizenship – considering for that different behavioural constructs, including engagement, outcomes, social norms, agency, and relational model.

Coopérnico's vision is to reshape the energy sector entirely, gradually increasing the number of citizens engaged in a more decarbonized and socially just society. For that, the cooperative relies on spill over and network effects stemming from its growing customer base, as well as on its national lobbying and community engagement activities. By looking at the scope of Case Study 3, it can be inferred that the main relevant actors for this study are the cooperative (as a business entity) and its members (consumers and prosumers), policymakers at the national level (namely, the legislator and the regulator), and cleantech suppliers. The relationship among those actors (at the policy, technology, institutional, financial, environmental, and social levels) shape favourable or unfavourable conditions for a citizen-centric clean energy transition in Portugal and, consequently, for the emergence of energy citizenship.

Each involved actor in this case study has a fundamental role in the clean energy transition in Portugal. Following a top-down approach, the legislator is responsible for transposing citizen-centric European Directives into enabling legal frameworks in the country. At the same time, the regulator is responsible for informing and clarifying the market dynamics brought forth by those enabling legal frameworks, as well as providing appropriate regulatory environments for implementing and validating pilot projects in practice. Furthermore, cleantech suppliers provide technological solutions and enable the appropriate digital and physical settings that allow citizens to participate proactively in the clean energy transition. Finally, the cooperative (and, by extension, its members) lobby and fight for the democratisation of the clean energy transition to have a level playing field with other traditional players in energy markets.

The 3-stage energy citizenship framework was implemented through the conduction of semi-structured interview protocols with the involved actors. Also, different conclusions were reached for each behavioural construct. Specifically, in terms of goals and (present and future) behaviours per actor, it can be said that they all strive for a citizen-centric clean energy transition within their capacities. Furthermore, in terms of

positive and negative outcomes associated with the involvement in the clean energy transition, these were clustered in three distinct categories: environmental, social, and economic. In line with that, all involved actors perceived similar environmental and social outcomes (i.e., reduced environmental impact and carbon footprint; and citizen empowerment, respectively). As for economic outcomes, while the government perceived it from the perspective of the grid, all other actors perceived it from the perspective of the citizen. All actors report different challenges to engage in the clean energy transition - while the cooperative and its members focus on challenges associated with the operationalisation of the cooperative itself, the government and cleantech suppliers share challenges associated with licensing processes and the pace of evolution of enabling legal frameworks.

In terms of social norms, although citizens, cooperatives, cleantech companies are intrinsically motivated to participate in a citizen-centric clean energy transition, they feel neglected and unsupported by the government and the DSO to do so in view of the lack of institutional support. On the other hand, the government suggests that its collective standpoint towards the clean energy transition often clashes with individual interests from different actors.

In terms of agency to engage in the clean energy transition, most actors indicate the need for expertise in technical, financial, market operation, and legal matters, which is often outsourced in view of a lack of institutional support.

Finally, in terms of the relational model, difference inferences can be made. Non-conflicting, reciprocated relationships exist between the cooperative (and its members) and cleantech businesses, and between cleantech businesses and the regulator. The legislator, however, has an antagonised relationship with energy citizens, the cooperative, and cleantech businesses. Another antagonised relationship is that between the DSO and all involved actors. Contrarily to that, all involved actors share a feeling of support by local stakeholders (i.e., local associations, the local public administration, energy agencies) and academia.

From a policy development perspective, this study was fundamental to shed light on the most pressing shared needs among different actors, including: (i) the creation of dedicated information agencies / desks (at the governmental level) to support citizens and companies in the clean energy transition (e.g., to support the implementation of RECs); (ii) the simplification of licensing processes; and (iii) the faster transposition of citizen-centred European Directives. Also, the Portuguese energy sector should evolve to comprise the conceptualization of RECs within which its members can participate in the provision of demand-side energy flexibility services alongside P2P energy sharing and collaborative self-consumption. By doing so, it is possible to increase system flexibility through competitiveness in the electricity markets, and to further incentivize joint investments in renewables through RECs, emphasizing on transparent and non-discriminatory integration of these new market players as expected by the European Commission.

All in all, it can be inferred from the interview results that all actors showcased a high level of interest in the topics under discussion - thus manifesting strong commitment and interest in the GRETA project, as well as demonstrating a (possible) shared knowledge among them since they were able to make sense of the complex, qualitative concepts underlying the interviews.

Annex 1: Semi-structured interview protocol

Part A – General information

- Name of the interviewee
- Name of company / organisation (for all actors other than Coopérnico's members)
- Position inside the company / organisation (for all actors other than Coopérnico's members)

Part B – Past behaviour and planned actions

Code	Behaviours and planned actions associated with engaging in the clean energy transition
ENG1	Did you proactively engage in the clean energy transition in the recent past?
ENG2	Do you plan on proactively engaging in the clean energy transition in the near future?
ENG3	Do you plan on proactively engaging in the clean energy transition in the long term?

Part C – Potential outcomes

Leading statement: the objective of this section is to collect general information and opinion about the possible outcomes that the engagement in the clean energy transition may imply for the interviewee. Two scenarios might be considered: (i) first scenario: if the interviewee considers not engaging in the clean energy transition; (ii) second scenario: if the interviewee considers engaging in the clean energy transition.

Code	Outcomes associated with engaging in the clean energy transition
C1	What do you see as the advantages / gains / benefits of your engagement in the clean energy transition in the next year?
C2	What do you see as the disadvantages / drawbacks of your engagement in the clean energy transition in the next year?
C3	Is there anything else, either positive or negative for you, that you associate with your engagement in the clean energy transition in the next year?
Code	Outcomes associated with not engaging in GRETA
C4	What do you see as the advantages / gains / benefits of you not engaging in the clean energy transition in the next year?
C5	What do you see as the disadvantages / drawbacks of you not engaging in the clean energy transition in the next year?
C6	Is there anything else, either positive or negative for you, that you associate with you not engaging in the clean energy transition?

Part D – Social norms

Leading statement: the objective of this section is to collect information and opinion about people (friends, family, peers, etc.), organisations, institutions, competitors, consumers, regulations, European directives, shareholders, or national initiatives pressing the interviewee to engage in the clean energy transition.

Code	Normative referents associated with the engagement in the clean energy transition
D1	Are there any people, organisations, or institutions who you think want / push you to engage in the clean energy transition?
D2	Are there any people or institutions / organisations that you think oppose that you engage in the clean energy transition?

D3	Does anybody else come to mind when you think about you engaging in the clean energy transition?
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Part E – Agency to engage in the clean energy transition

Leading statement: the objective of this section is to collect information and opinion concerning the type of resources, time, and skills that are required for the interviewee to engage in the clean energy transition.

Code	Agency to engage in the clean energy transition
E1	What kind of skills or abilities you had to develop to engage in the clean energy transition?
E2	What do need to know to engage in the clean energy transition?
E3	What kind of information do you think you need to engage in the clean energy transition?
E4	What additional resources in terms of time / money do you think you need to engage in the clean energy transition?
E5	Are there any people or institutions from which you need help from to engage in the clean energy transition?
E6	Are there any circumstances / opportunities you rely on to engage in the clean energy transition?
E7	Are there any constraints you think are stopping you to engage in the clean energy transition?
E8	Do you have any previous experience with the clean energy transition?
E9	Any other relevant experience that affects your decision to engage in the clean energy transition?

Part F1 - Relational models (for citizens)

Code	Type of relational model in operation vs desirable
RM1	How would you describe your relationship with the government?
RM2	How would you describe your relationship with companies providing services and products for the clean energy transition?

Part F2 - Relational models (for cleantech businesses)

Code	Type of relational model in operation vs desirable
RM1	How would you describe your relationship with the government?
RM2	How would you describe your relationship with renewable cooperatives and its members?

Part F3 - Relational models (for policymakers)

Code	Type of relational model in operation vs desirable
RM1	How would you describe your relationship with renewable cooperatives and its members?
RM2	How would you describe your relationship with companies providing services and products for the clean energy transition?