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Artículos

Profiles and categorisation of perceptions and attitudes among European citizens regarding the just energy transition

Perfiles y categorización de percepciones y actitudes de los ciudadanos europeos sobre la transición energética justa

Pablo García-García[1,a]
[1]Universidad de León, León, Spain

[a]pagag@unileon.es

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Abstract

Just energy transitions have re-emerged from their unionist roots to gain increasing momentum politically and scholarly, especially driven by the SDGs. In the movement from unionism to mainstream debate, the notion has acquired diverse nuances that determine its normative scope. Four major approaches have been theoretically proposed to classify views currently: statu quo, managerial, structural, and transformative. Implicitly, these approaches observe two dimensions: individualism versus collectivism, and green growth versus post-growth. Although this classification has been useful to study the positions of groups of individuals in international organisations, NGOs, and activist movements, this paper suggests testing if it remains operative in contrast with individuals' attitudes and perceptions. Through basic statistics, clustering algorithms, and correspondence analysis applied to the most recent version of the European Social Survey (2020-2022), this contribution finds three key insights. First, although the empirical four-group classification resembles some of the theoretical traits, it does not fit the approaches. The individualism versus collectivism dimension is operational, but the environmental dimension is difficult to determine. Second, empirically, twenty-three optimal groups exist. Three groups congregate more than 90% of respondents. The remaining marginal but optimal groups point to the relevance of observing isolated profiles in the study and political planning of just energy transitions. Finally, human values show greater explanatory capacity than sociodemographic and political variables.
Keywords: just energy transition; social-environmental awareness; individual attitudes; perceptions; Europe.

Resumen

Las transiciones energéticas justas han resurgido de sus raíces sindicalistas para ganar un impulso político y académico cada vez mayor, especialmente promovidas por los ODS. En el paso del sindicalismo al debate general, la noción ha adquirido diversos matices que determinan su alcance normativo. Se han propuesto teóricamente cuatro enfoques principales para clasificar los puntos de vista en la actualidad: statu quo, gerencial, estructural y transformador. Implícitamente, estos enfoques observan dos dimensiones: individualismo versus colectivismo y crecimiento verde versus postcrecimiento. Si bien esta clasificación ha sido útil para estudiar las posiciones de grupos de individuos en organizaciones internacionales, ONG y movimientos activistas, este artículo sugiere comprobar si sigue siendo operativa en contraste con las actitudes y percepciones de los individuos. A través de estadísticas básicas, algoritmos de agrupamiento y análisis de correspondencias aplicados a la versión más reciente de la Encuesta Social Europea (2020-2022), esta contribución encuentra tres ideas clave. Primero, aunque la clasificación empírica de cuatro grupos se asemeja a algunos de los rasgos teóricos, no se ajusta a los enfoques. La dimensión individualismo versus colectivismo es operativa, pero la dimensión ambiental es difícil de determinar. En segundo lugar, existen empíricamente veintitrés grupos óptimos. Tres grupos congregan a más del 90% de los encuestados. Los restantes grupos marginales pero óptimos señalan la relevancia de observar perfiles aislados en el estudio y la planificación política de las transiciones energéticas justas. Finalmente, los valores humanos tienen mayor capacidad explicativa que las variables sociodemográficas y políticas.

Palabras clave: transición energética justa; concienciación social-medioambiental; actitudes individuales; percepciones; Europa.

1. Introduction

Just energy transitions are currently leading the political focus worldwide. The concept, rooted in the claims of the Oil, Chemical and Atomic Workers International Union (OCAW) in the 1970s, has re-emerged to face social and environmental deterioration, particularly boosted by the Sustainable Development Goals (SDGs). In roughly five decades, the idea has transcended context-specific unionism to gain international momentum in the mainstream discourse.

As a normative notion, it admits different approaches, as observed in political programmes, current unionist claims, statements of Non-Governmental Organisations (NGOs), and opinions (Just Transition Research Collaborative, 2018). The approaches to the just energy transition are the result of different perceptions and values, hence diverse, complex, and evolving.

In the scholarly literature and technical reports, most studies perform socioeconomic and energy indicators analyses and/or develop models to test the social and environmental effects of policies and scenarios (García-García et al., 2020). However, recent insights point to the role of perceptions in the process, i.e., the level of awareness of citizens, their beliefs and opinions, and their interpretation of the information that they receive. This issue is currently increasing its relevance in the general literature about the transition to sustainability in general, being proof of this general interest Macht et al. (2022), Morgunova & Shaton (2022), Panarello & Gatto (2022), and Thomas et al. (2022). However, it reaches a special and meaningful relevance in the range of just energy transitions, as they combine environmental awareness, energy policy and management, and socioeconomic impacts and social policies.

Precisely regarding just energy transitions, hence with more restricted publications, literature warns that perceptions can diverge significantly from the information reflected by indicators, potentiate, or hinder the evolution of the energy transition, and be influenced by stakeholders to determine the results (Gawel et al., 2015; Gölz & Wedderhoff, 2018; Groh & Ziegler, 2018; Kuschan et al., 2022). Considering their potential, as observed in fields like Sustainable Welfare, the presence of eco-social perceptions in the population is key to fostering a social and environmental synergy (Fritz & Koch, 2019; Koch & Fritz, 2014; Otto & Gugushvili, 2020), and subsequently a just transition.

Theoretically, four major approaches to the normative nature of just energy transitions have been described, based on the preference for individualism or collectivism, and economic growth or post-growth. Notwithstanding, the reality could be more complex and richer.

This paper suggests testing the current perceptions of European citizens facing the just energy transition towards sustainable sources to reach decarbonised economies and determining whether such perceptions match the described approaches or not. Section 2 contextualises the topic under analysis and presents the hypothetical classification of approaches. Section 3 discloses the data sources and methodology that this contribution proposes to test such a classification. The results are presented in Section 4. Finally, Section 5 draws the main conclusions.

2. Contextualisation

The seed of the present idea of just energy transition is the claim for adequate conditions in the American oil refining sector in the context of the oil crises in the 1970s (Just Transition Research Collaborative, 2018). Originally, it gathered elements of the social environmentalist movement and the demands for occupational health and safety (Schlosberg & Collins, 2014).

In the last decades, the idea was adapted to other unionist sectors, overflowed the American context, and was adopted internationally. Recently, it has been updated in the framework of the SDGs by the International Labour Organisation (ILO) as a response to the social and environmental weakening that characterises the 21*st* century (ILO, 2018; Poschen, 2017).

The leap between unionism and mainstream discourses worldwide has motivated the emergence of a diversity of users of this concept. Its normative nature admits multiple approaches to what a just energy transition should be. The Just Transition Research Collaborative (2018) proposes a classification that has adequately served to categorise the discourses of governments, international organisations, NGOs, and activist movements, inter alia. The classification implicitly employs two dimensions: the preference for individualism versus collectivism, and the preference for economic growth versus post-growth. As a result, four major approaches emerge (Figure 1):

- Statu quo (individualism and growth). It pictures a voluntary transition to a green economic system supported by market-based instruments.
- Managerial reform (less individualism and growth). It conceives greater public intervention without altering the statu quo balance of socioeconomic power.
- Structural reform (slight collectivisation and prosperity without growth). It supports a redistribution of power that goes beyond the increase in public intervention and denies the adequacy of green growth paradigms.
- Transformative approach (collectivism and post-growth). It prefers the collective management of resources and activities, hence radically changing the socioeconomic balance of power, and suggests post-growth initiatives, with particular emphasis on degrowth.

Figure 1. Major approaches to the just energy transition

Source: Own elaboration.

This categorisation has served to detect that international organisations adopt managerial or structural approaches, and unionist and activist organisations tend to the transformative paradigm (Just Transition Research Collaborative, 2018). Moving from the consensus of a group of individuals under the form of governments, organisations, or movements, to the perceptions and attitudes of individuals, there is a gap. Do individual perceptions match the major approaches? Can additional nuances be detected?

3. Data and methodology

To analyse the perceptions and attitudes of individuals in Europe, this paper takes the most recent data from the European Social Survey (ESS) (European Social Survey European Research Infrastructure (ESS ERIC), 2022a). The ESS is a biennial cross-national survey that statistically

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represents individuals aged 15 and over. The process to build its database ensures comparability and compliance with research ethics (International Statistical Institute, 2010). The process begins with a call for question module design teams to conform the source questionnaires that are translated into the national languages of the countries that participate in the edition. The design of the sample grants comparability in the process of data collection and monitors the national situation of the country where the data collection is being conducted. Finally, data are processed, archived, and made publicly available after succeeding in a data quality assessment. Further details about these procedures can be consulted in the methodological section of the official webpage (European Social Survey European Research Infrastructure (ESS ERIC), 2022b).

The first questionnaire, published in June 2022, was conducted from September 2020 to January 2022 in 10 European countries. It addresses multiple topics. Given the goal of this research, this analysis restricts its focus to the questions that reveal the attitudes and perceptions of citizens regarding the just energy transition, i.e., perceptions and values regarding environmental awareness, institutional adequacy, social justice, openness to receive information, and sociodemographic traits. Table 1 presents the variables, summarised description, and valid ranges. Variables admit that the interviewees do not respond or manifest their lack of knowledge about the issue of the question. In such cases, an exceptional value is indicated in the database. Those special values ought to be consulted in the ESS database.

Table 1. Variables

Variable	Summarised description	Range
nwspol	Typical daily time watching, reading, or listening to news about politics and current affairs (minutes)	Open
netustm	Typical daily time using the internet (minutes)	Open
pplfair	Belief in people taking advantage of you or being fair	0: Most people try to take advantage of me. 10: Most people try to be fair
trstprl	Personal trust in the country's Parliament	0: No trust at all. 10: Complete trust.
trstlgl	Personal trust in the legal system	0: No trust at all. 10: Complete trust.
trstep	Personal trust in the European Parliament	0: No trust at all. 10: Complete trust.
trstsci	Personal trust in scientists	0: No trust at all. 10: Complete trust.
pbldmna	Taking part in public demonstrations in the last 12 months	1: Yes. 2: No.
volunfp	Volunteering for a not-for-profit or charitable organisation in the last 12 months	1: Yes. 2: No.
lrscale	Position in the political spectrum	0: Left. 10: Right.
gincdif	Duty of the government to take measures to reduce differences in income levels	1: Agree strongly. 5: Disagree strongly.
happy	Level of happiness	0: Extremely unhappy. 10: Extremely happy.
rlgdgr	Religiousness	0: Not at all religious. 10: Very religious.
ccnthum	Cause of the climate change	1: Entirely by natural processes. 5: Entirely by human activity.
ccrdprs	Feeling a personal responsibility to try to reduce climate change	0: Not at all. 10: A great deal.
wrclmch	Worry about climate change	1: Not at all worried. 5:Extremely worried.
testic37	Contribution of a large number of people limiting their energy use to reduce climate change	1: Not at all likely. 4: Very likely.

Variable	Summarised description	Range
rghmgpr	Importance in a democracy of protecting the rights of minority groups	0: Not at all important for democracy in general. 10: Extremely important for democracy in general.
cttresa	Importance in a democracy of treating everyone the same in the courts	0: Not at all important for democracy in general. 10: Extremely important for democracy in general.
gvctzpv	Importance in a democracy of governmental protection against poverty for all citizens	0: Not at all important for democracy in general. 10: Extremely important for democracy in general.
grdfinc	Importance in a democracy of governmental measures to reduce the differences in income levels	0: Not at all important for democracy in general. 10: Extremely important for democracy in general.
viepol	Importance in a democracy of prioritising the views of ordinary people over those of the political elite	0: Not at all important for democracy in general. 10: Extremely important for democracy in general.
keydec	Importance in a democracy of making key decisions in national governments rather than in the EU	0: Not at all important for democracy in general. 10: Extremely important for democracy in general.
implvdm	Importance of living in a country that is governed democratically	0: Not at all important. 10: Extremely important.
gndr	CODE SEX, respondent	1: Male. 2: Female.
agea	Age of respondent, calculated	Open
chldhhe	Presence of children	1: Yes. 2: No.
domicil	Description of the area in which the citizen lives	1: A big city. 5: Farm or home in country side.
edulvlb	Highest level of education successfully completed	0: Not completed ISCED level 1. 800: ISCED 6, doctoral degree.
mainact	Employment situation in the last 7 days	1: Paid work. 8: Housework, looking after children, others.
mbtru	Current or past membership of a trade union or similar	1: Yes, currently. 3: No.
ipcrtiv	Similarity to a person who thinks up new ideas and likes to do things in her/his own original way. Being creative is important to her/him.	1: Very much like me. 6: Not like me at all.
ipeqopt	Similarity to a person who thinks it is important that every person in the world should be treated equally and believes everyone should have equal opportunities in life	1: Very much like me. 6: Not like me at all.
ipudrst	Similarity to a person who thinks it is important to her/him to listen to people who are different from her/him, even when she/he disagrees with them	1: Very much like me. 6: Not like me at all.
impfree	Similarity to a person who thinks it is important to her/him to make her/his own decisions about what she/he does and likes to be free and not depend on others	1: Very much like me. 6: Not like me at all.
iphlppl	Similarity to a person who thinks it is very important to her/him to help the people around her/him and wants to care for their well-being	1: Very much like me. 6: Not like me at all.
ipstrgv	Similarity to a person who thinks it is important that the government ensures her/his safety against all threats and wants the state to be strong so it can defend its citizens	1: Very much like me. 6: Not like me at all.
impenv	Similarity to a person who strongly believes that people should care for nature and looking after the environment is important	1: Very much like me. 6: Not like me at all.
imptrad	Similarity to a person who thinks tradition is important and tries to follow the customs handed down by her/his religion or her/his family	1: Very much like me. 6: Not like me at all.

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Variable	Summarised description	Range
impfun	Similarity to a person who seeks every chance she/he can to have fun and thinks it is important to her/him to do things that give her/him pleasure	1: Very much like me. 6: Not like me at all.

Source: own elaboration.

Once the data source and the variables have been disclosed, the methodological procedures are carried out as follows.

First, a general description is made based on basic statistical calculations. This analysis mainly focuses on the statistical mode and standard deviation of each variable. The mere employment of the mean values for description is not adequate due to the presence of the cited exceptional values.

Second, provided that four major approaches have been proposed to classify the views about the just energy transition, this analysis suggests the execution of a clustering algorithm that fits observations into four groups.

Clustering is a technique that calculates the most internally homogenous groups in a sample of diverse individual observations to provide coherent taxonomies based on direct evidence. Clustering algorithms are wide-ranging, yet four typologies can be distinguished. 1) Centroid-based algorithms classify observations based on a user-defined centre. 2) Density-based algorithms generate groups by connecting parts of the sample that present a high concentration of observations. 3) Distribution-based clustering adjusts observations into groups by assigning a given theoretical distribution. 4) Hierarchical algorithms provide a classification of observations at different distances that is consistent in reiterated executions.

This methodology suggests the employment of a centroid-based algorithm. Nevertheless, instead of defining the centres of the clusters a priori, the centres are calculated by the algorithm after inputting that the desired number of groups is four through a k-means typology. Consequently, the interpretation of the groups serves to identify whether clusters align with the previously described approaches or not and the reasons for a potential divergence, by analysing the centre of each cluster and the distribution of individuals among them.

Third, calculating an optimal panoply of clusters that is strictly based on data to derive an adequate categorisation of perceptions. To do so, Ward's hierarchical clustering algorithm in squared Euclidean distances is prescriptive, provided that this typology calculates a panoply of clusters at different distances. Given the typology of data, with different scales and some open-range variables in different units (time, age, etc.), inputs are standardised in z-scores.

To determine the number of clusters, the user normally selects a cutting point distance according to the analytical needs. Instead, this methodology suggests the application of Thorndike's criterion of optimality (Thorndike, 1953), which determines the optimal number of clusters according to data, hence replacing the arbitrary selection of the user. According to the criterion, the number of clusters that achieves the greatest reduction in distances between clusters is optimal.

Fourth, observing the relations between variables to derive further insights about the functioning of these perceptions and attitudes in the context of just energy transition. To observe such relations, this paper proposes performing a Multiple Component Analysis (MCA). MCA is a statistical multivariant technique that aims at summarising many variables of a nominal nature into a reduced number of dimensions and factors. Consequently, it condenses data into a more manageable set of information and, ultimately, points to the meaningful dimensions and factors that define the methodological selection, as well as the relations between them.

4. Results

According to the analytical goals, the results are structured into four subsections. Section 4.1 draws the observed perceptions and attitudes in the survey through basic statistics. Section 4.2 tests the suitability of a four-group classification according to that proposed in general terms by the Just Transition Research Collaborative (2018), as introduced in Section 2. Section 4.3 calculates the optimal number of groups in a potential classification based on data through Thorndike's criterion of optimality. Finally, Section 4.4 introduces the explanatory capacity of the variables under study and their relations based on the MCA technique.

4.1. Basic statistics

Regarding mode, citizens follow current affairs through media for 60 minutes per day and the daily use of the internet is not applicable. It could be related to a mode of 61-year-old respondents. They have not participated in demonstrations in the last 12 months, which can be conditioned due to the COVID restrictions. Likewise, they have not taken part in volunteering activities. Most of them agree with the governmental intervention to reduce differences in income levels. They consider themselves very happy (8 out of 10), despite the pandemic situation. Most of the interviewees have had children and live in a country environment.

A preference for medium values is consistently observed in multiple variables. Such is the case of those related to trust. Citizens think that people do not try to take advantage of them, but they are not fair. There is a medium trust in the national Parliament, the legal system, and the European Parliament. Notwithstanding, most people prefer not to answer to their level of trust in scientists. The preference for medium values is also observed in the case of positioning in the political spectrum, as most of the citizens align with the political centre. It also happens with the cause of climate change, as most of the interviewees think that it is equally a natural and human-induced process. Hence, they mostly do not feel responsible or irresponsible to contribute to reducing it and are somewhat worried about it. They choose the non-applicability of the effect of the reduction of electricity consumption on climate change.

The preference for medium options is also present in the questions related to human values. Most of them identify with a creative and independent person, who thinks that everyone deserves to be treated equally and be listened to despite different opinions, helps people around, respects nature and traditions, values fun, and pleasure, and expects that the government provides safety.

The medium is not the case for some variables that take extreme mode values. This is the circumstance for religiousness, as most citizens declare that they are not religious. They also declare that protecting the rights of minority groups, providing equal treatment of individuals in the courts, protecting citizens against poverty, taking measures to ease income inequalities, and prevailing the views of ordinary people over elites are extremely important for democracy in general. In addition, they mostly think that it is important for democracy to take decisions in national governments rather than in European institutions and living in a democratic country is extremely important for them.

Most of them have achieved an education level compatible with vocational ISCED 3A, access upper tier ISCED 5A/all 5, but none of the employment situations provided in the questionnaire applies to them. They do not belong to a trade union.

The highest standard deviations are registered in the following of media, use of the Internet, and level of education. In contrast, the lowest occur in the participation in public

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demonstrations and volunteering activities, the duty of the government to reduce inequality, the worry about climate change, the effect of decreasing electricity consumption on climate change, the presence of children, the type of location of the domicile, the participation in trade unions, and the identification with the human values.

4.2. Suitability of a four-group classification

To produce the four clusters, the computations of each centre through the k-means algorithm picture the groups according to each variable (initial centres, crosschecked final centres) in Table 2. The main insights are interpreted in Table 3.

Table 2. Four-cluster classification, proportion of individual assignations, and profiling.

	Cluster			
	1	2	3	4
nwspol	0	7777	8888	0
netustm	8888	60	8888	120
pplfair	6	10	4	7
trstprl	5	3	1	5
trstlgl	99	4	88	5
trstep	8	5	6	5
trstsci	8	5	4	5
pbldmna	2	2	2	2
volunfp	2	9	2	2
lrscale	99	0	5	5
gincdif	2	2	4	2
happy	6	4	7	8
rlgdgr	2	4	5	0
ccnthum	4	3	5	3
ccrdprs	0	5	7	7
wrclmch	2	2	8	2
testic37	6	6	6	6
rghmgpr	8	10	8	7
cttresa	8	5	5	8
gvctzpv	8	10	8	8
grdfinc	8	10	8	8
viepol	8	88	10	8
keydec	9	10	8	6
implvdm	7	10	10	9
gndr	1	1	1	1
agea	16	24	61	25
chldhhe	2	2	7	9
domicil	1	4	7	9

	Cluster			
	1	2	3	4
edulvlb	213	321	7777	9999
mainact	66	66	66	99
mbtru	3	3	3	9
ipcrtiv	4	1	5	9
ipeqopt	5	1	4	9
ipudrst	5	1	2	9
impfree	2	3	2	9
iphlppl	5	2	4	9
ipstrgv	2	1	3	9
impenv	2	3	2	9
imptrad	5	5	4	9
impfun	3	3	2	9
Ind. Assign.	28.55%	68.64%	2.40%	0.41%

Source: Own elaboration.

Cluster 1. Low interest in current affairs through media, absence of knowledge about the use of the Internet, slight tendence to believe that people is fair, medium trust in the national parliament, no answer about trust in the legal system, high trust in the European parliament and scientists, low participation in demonstrations and volunteering, no answer in the ideological spectrum, agreement with governmental measures to reduce income inequality, high-medium happiness, not very religious, belief in mostly human induced climate change, low personal responsibility in reducing climate change, not very worried about climate change, not applicable connection between reduction in electricity consumption and climate change, high importance of protecting the rights of minorities, providing equal treatment in the courts, protecting against poverty, implementing measures to reduce inequality, prioritising the views of people over elites, taking key decisions nationally, high preference for democracy, age centred in 16 years old, no or low experience with children, domicile in a big city, general ISCED 2A access ISCED 3A general/all 3, not applicable employment situation, no union membership, and medium identification with human values. This cluster is determined by centres that do not show a particular preference for individualism or collectivism but advocate for public intervention, despite the environmental matter having a low profile.

Cluster 2. Refusal to answer about media following, 60 minutes of Internet use, high belief in people's fairness, low trust in the national Parliament, the legal system, medium trust in the European Parliament and scientists, low participation in demonstrations, no answer to volunteering activities, left-leaning ideology, agreement with governmental measures to reduce inequality, low-medium happiness, low-medium religiousness, climate change considered equally natural and human induced, medium responsibility to reduce climate change, slightly worried about climate change, not applicable connection between reduction in electricity consumption and climate change, extremely importance of protecting the rights of minorities, protecting people against poverty, and taking measures to reduce inequality, medium importance of equal treatment in courts, no knowledge about the priorities between people and elites, extreme importance of deciding nationally and democracy, age centred 24 year-old, no children, country village domicile, vocational ISCED 3C >= 2 years no access ISCED 5, not applicable employment situation, no union membership, very high identification with

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creativeness, equalitarianism, tolerance, and government intervention for safety, some identification with independence, protection of nature, and fun/pleasure, identification with helping people, and no identification with tradition. This cluster tends to collectivism but is reluctant to align with public institutions and interventions. From the environmental viewpoint, there is higher awareness than in the previous cluster. Notwithstanding, individuals tend to align with the mode and show doubts about the effects of energy frugality.

Cluster 3. No knowledge about media following and Internet use, slight tendence to believe that people try to take advantage, very low trust in the national Parliament, no knowledge about trust in the legal system, high-medium trust in the European Parliament, low-medium trust in scientists, low participation in demonstrations and volunteering, centre ideological alignment, disagreement in the application of measure to reduce unequal income levels, high happiness, medium religiousness, belief in an entirely human-induced climate change, high personal responsibility in reducing climate change, no knowledge about the worry of climate change, not applicable connection between reduction in electricity consumption and climate change, high importance of protecting the rights of minorities, medium importance of equal treatment in the courts, high importance of governmental measures to protect people from poverty and reduce inequality, extreme importance of prioritising citizens' views over elites, high importance of making key decisions nationally, extreme importance of living in a democracy, age centred 61 year-old, refusal to answer about children, domicile type, and education level, not applicable employment situation, no union membership, no identification with creativeness, a little identification with equalitarianism, helping others, and traditions, identification with tolerance, independence, protection of nature, and fun/pleasure, and some identification with the governmental safety claim. This cluster has a notable individualistic attitude, combined with environmental awareness, despite the centre does not disclose the level of worry about climate change.

Cluster 4. No following of media, 120 minutes of use of Internet, high belief that people try to take advantage, medium trust in the national Parliament, the legal system, the European Parliament, and scientists, no participation in demonstrations and volunteering, centre political alignment, agreement with measures to reduce income inequality, high level of happiness, not at all religious, belief in an equally natural and human-induced climate change, high personal responsibility in reducing climate change, slightly worried about climate change, not applicable connection between reduction in electricity consumption and climate change, high importance of protecting the rights of minorities, equal treatment in the courts, protection against poverty, governmental programmes to reduce income inequality, and predominance of people's view over elites, high-medium preference for key decisions in a national context, very high importance of democracy, age centred 25 year-old, no answer about children, domicile type, education, and employment situation, no answer about union membership, and no answer about human values. This cluster is not consistent and shows a marginal characterisation, with a centre in the absence of answers for many questions, and less clear inferences about attitudes.

Out of 18,060 individual observations, 17,940 have resulted as valid, and 120 have been lost in the calculation. Out of the valid observations, 5,122 have been attributed to Cluster 1, 12,314 to Cluster 2, 431 to Cluster 3, and 73 to Cluster 4.

Table 3. Summary of traits of the four clusters.

Cluster	Traits
1	No preference for individualism or collectivism yet supportive of public intervention. Low environmental profile.
2	Tendency to collectivism yet reluctant to trust public institutions and intervention. Higher environmental awareness combined with doubts about the effects of measures.
3	Tendency to individualism and environmental awareness but inconclusive worry about climate change.
4	Non consistent traits. Marginal nature.

Source: Own elaboration.

At this point, key facts emerge both from the basic statistics and the exercise of clustering:

- There are generalised doubts about the effectiveness of energy frugality in the progress of climate change. Hence, the growth dimension is difficult to assign.
- The dimension of individualism versus collectivism is operational.
- Clusters do not align with the typology of approaches under examination, yet the centres of Cluster 1 resemble the managerial or structural approach, Cluster 2 the transformative approach, and Cluster 3 the statu quo approach. The main cause of this finding is the lack of conclusiveness of attitudes towards the environment and the environmental effects of frugality. Some traits, already pointed to by the mode, are shared by the centres of all clusters.

These insights could be enriched through a calculation of the optimal number of clusters. If a four-group classification is simplistic and does not properly match the theoretical classification of approaches, how many approaches are there empirically?

4.3. Optimal number of groups and their traits

By applying Thorndike's criterion, the optimal number of clusters is 23, as this number achieves the greatest reduction of distances between groups. These are the factual profiles of awareness and their associated demographic traits (Table 4).

Table 4 illustrates both the plurality of approaches, but also the marginality of most of them, except for clusters 8 (it gathers 23.94% of individuals in terms of valid observations), 10 (45.95%), and 13 (21.74%). The rest of the groups roughly congregate between 0.01% and 3.4% of observations. The finding of these groups of marginal relevance through a methodology that avoids aprioristic quantifications and relies on optimality points to the existence of significant marginal profiles that ought to be observed and understood.

To contribute to this observation and understanding, the next Section discloses the most representative and informative variables in the sample, as well as their relation.

Table 4. Optimal number of clusters, proportion of individual assignations, and profiling

	Clusters																						
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
nwspol	9999	60	100	270	8888	360	8888	1100	2	20	8888	935	0	8888	0	8888	30	1014	7777	1200	7777	7777	7777
netustm	6666	720	9999	6666	9999	6666	120	6666	7777	20	8888	8888	1380	6666	6666	25	120	600	600	90	8888	6666	7777

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	Clusters																						
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
pplfair	0	6	5	0	6	3	9	2	0	1	4	1	0	5	5	0	8	8	2	6	6	3	5
trstprl	0	2	1	1	0	5	7	7	4	3	1	4	0	5	77	7	5	6	5	4	7	1	7
trstlgl	2	4	1	0	5	5	8	8	9	88	88	5	0	5	77	9	6	6	7	9	5	0	6
trstep	0	5	0	1	1	6	7	6	1	88	6	5	0	88	77	0	7	5	5	4	6	1	10
trstsci	5	99	4	3	8	99	9	7	99	99	4	9	88	5	10	5	8	5	99	99	99	1	10
pbldmna	2	2	2	2	2	2	2	2	2	2	2	2	2	2	7	2	2	8	2	2	2	2	7
volunfp	1	2	1	2	2	2	1	2	2	2	2	2	2	2	7	2	2	2	2	2	2	2	2
lrscale	2	6	1	6	5	7	5	5	88	10	5	77	88	5	77	99	3	8	3	6	6	7	88
gincdif	2	2	2	3	3	1	3	2	3	5	4	1	1	2	7	1	5	1	1	2	4	2	3
happy	5	7	6	8	8	10	9	8	9	5	7	10	10	6	10	6	7	5	7	7	6	6	8
rlgdgr	4	0	7	99	7	10	8	8	0	5	5	5	10	5	5	8	0	6	10	6	0	10	6
ccnthum	3	3	3	3	4	3	3	4	4	3	5	4	3	3	4	5	3	2	4	5	4	4	3
ccrdprs	0	5	2	4	5	10	3	6	7	10	7	5	5	4	88	10	88	7	8	10	8	7	10
wrclmch	3	3	2	3	3	2	2	4	5	3	8	4	3	3	3	1	1	3	3	5	3	3	4
testic37	6	2	6	6	6	6	6	6	6	6	6	6	3	3	3	6	2	6	6	6	3	6	3
rghmgpr	2	10	1	3	7	10	88	10	4	9	8	6	1	5	77	7	10	4	10	6	6	8	7
cttresa	0	8	2	4	9	10	10	9	10	7	5	10	10	10	77	5	10	77	10	6	7	6	10
gvctzpv	0	8	1	5	8	10	8	10	7	9	8	88	10	10	77	8	3	6	10	6	6	7	10
grdfinc	3	7	2	3	8	10	8	10	8	9	8	10	10	10	77	5	88	6	10	7	6	5	7
viepol	0	9	0	5	8	10	10	9	10	7	10	8	10	8	77	8	5	6	10	5	7	3	9
keydec	5	7	3	4	6	10	7	9	10	10	8	8	10	6	77	9	10	6	8	7	6	6	7
implvdm	1	10	2	8	8	10	10	10	8	10	10	10	0	8	10	9	10	7	10	6	7	7	10
gndr	2	2	2	2	2	1	2	2	1	2	1	2	2	2	1	1	1	2	2	2	1	2	1
agea	37	29	23	56	73	72	51	79	16	59	61	52	48	79	32	35	34	39	32	38	31	71	45
chldhhe	6	6	2	6	1	1	6	1	2	2	7	1	6	1	2	1	1	9	2	6	2	6	7
domicil	4	3	4	1	4	3	1	3	3	2	7	4	4	9	5	4	1	9	1	1	4	4	3
edulvlb	323	5555	323	9999	323	5555	800	113	213	0	7777	710	323	9999	7777	9999	7777	9999	313	720	720	0	7777
mainact	66	66	66	66	66	66	66	66	66	66	66	66	66	99	66	66	66	99	66	66	66	66	66
mbtru	3	3	3	2	2	2	3	2	3	3	3	2	3	9	7	3	7	9	3	3	3	2	7
ipcrtiv	3	3	4	3	2	2	1	5	8	2	5	2	3	9	1	1	2	9	2	2	5	5	3
ipeqopt	5	4	4	3	2	1	1	1	6	4	4	4	1	9	1	2	8	9	1	1	3	4	1
ipudrst	3	6	2	4	2	1	1	2	3	3	2	1	1	9	1	4	8	9	1	3	3	4	4
impfree	5	1	2	3	3	1	1	1	2	3	2	4	1	9	7	1	8	9	1	1	3	3	5
iphlppl	3	3	2	4	3	2	1	2	1	3	4	3	1	9	7	3	4	9	1	1	3	5	3
ipstrgv	4	1	2	2	2	1	1	1	1	2	3	1	1	9	7	4	8	9	2	1	2	3	4
impenv	5	3	4	4	2	2	3	1	6	4	2	5	1	9	1	4	8	9	2	4	2	4	2

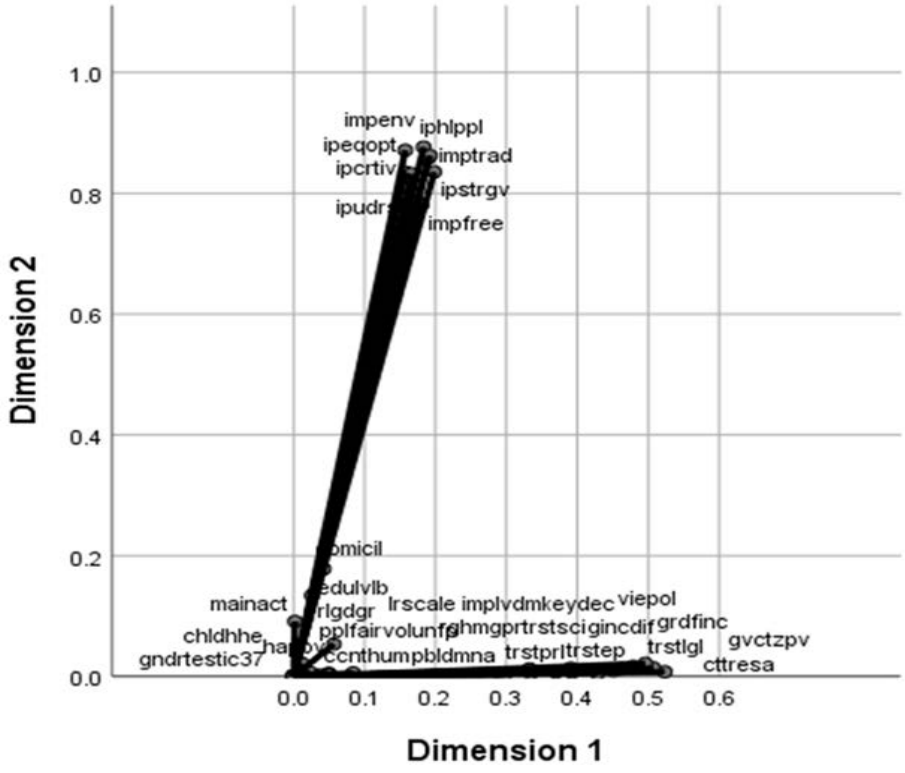
	Clusters																						
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
imptrad	4	6	4	4	2	3	1	2	6	3	4	3	1	9	7	2	5	9	4	2	3	3	3
impfun	4	6	3	4	2	4	1	3	1	4	2	3	6	9	7	2	4	9	1	2	3	4	4
Ind. Assig. (%)	0.86	0.09	0.06	0.07	0.51	0.02	0.76	23.94	3.40	45.95	0.01	1.15	21.74	0.01	0.06	0.01	0.11	0.06	0.12	0.95	0.09	0.05	0.01

Source: Own elaboration.

4.4. Relations between the variables

To visualise the results of the MCA, Figure 2 presents the discriminant measures of the reduction in two dimensions. Computation has obtained Cronbach's Alphas equal to 0.992 in Dimension 1 (inertia 0.223) and 0.989 in Dimension 2 (inertia 0.186).

Figure 2. Discriminant measures of the variables in two dimensions.



MCA indicates that the variables related to human values have the greatest explanatory capacities, as proven by higher measures in both dimensions and, visually, greater distance between these variables and the coordinate origin in Figure 2. These remarkable variables are, in descendant order based on average measures for both dimensions, caring for nature and looking after the environment (impenv, 0.530), following traditions (imptrad, 0.527), helping the people around and caring for their well-being (iphlppl, 0.524), ensuring governmental-led safety and a strong state to defend citizens (ipstrgv, 0.517), thinking up new ideas and being creative (ipcrtiv, 0.514), listening to people who are different even in disagreement (ipudrst, 0.499), treating every person equally and providing equal opportunities in life (ipeqopt, 0.496), making own decisions and liking freedom and independence (impfree, 0.481), and having fun and pleasure (impfun, 0.480).

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The lowest explanatory capacities are located closer to the coordinate origin in Figure 2 and correspond to gender (gndr, 0.000), the consideration about energy frugality to reduce climate change (testic37, 0.007), the belief in people taking advantage or being fair (pplfair, 0.015), the presence of children in the house (chldhhe, 0.017), the worry of climate change (wrclmch, 0.019), and the beliefs about the cause of climate change (ccnthum, 0.019).

The remaining variables oscillate from 0.026 (ccrdprs, i.e., feeling a personal responsibility to reduce climate change) to 0.266 (cttresa, i.e., importance of equal treatment in the courts).

5. Conclusions

Just energy transitions are congregating worldwide attention both politically and academically, particularly driven by the SDGs. Notwithstanding, the notion is not new. It can be traced to North American unionism during the oil crises in the 1970s. After some decades, the idea has transcended industry-specific unionism and is applied by multiple agents. The transcendence has motivated the emergence of different conceptions of the just energy transition as a normative goal to tackle social and environmental deterioration.

Four major approaches have been suggested from a theoretical viewpoint. These approaches are the statu quo, managerial, structural, and transformative conceptions. Implicitly the configuration of approaches is bi-dimensional, as it depends on two main ideas. On the one hand, the preference for individualism versus collectivism. On the other hand, the suitability of green growth strategies versus prosperity without growth strategies. The four-group classification has been useful to determine the position of international organisations, NGOs, unions, and activist moments, inter alia.

This paper proposes testing the four-group classification of approaches regarding the individual attitudes and perceptions of European citizens. The idea is to determine if such classification, which is useful at an aggregate corporative level, is valid in the downscaling towards the individual. To do so, the methodological proposal acts in four steps based on the most recent version of the European Social Survey (2020-2022). As a first step, it obtains basic statistics to draw the situation of the sample. Afterwards, it computes the traits of an empirical four-group classification through a k-means clustering algorithm. Subsequently, it determines the optimal number of empirical approaches through Ward's hierarchical algorithm supported by the criterion of optimality suggested by Thorndike. Finally, it discloses the relations among variables through a Multiple Correspondence Analysis.

Basic statistics determine both clear perceptions and attitudes and a bias for medium values in certain variables. Citizens tend to follow current affairs daily through conventional media, do not attend demonstrations and volunteering activities, support governmental intervention to alleviate inequality, consider themselves notably happy despite the pandemic context, have experience with children and live in country environments. Likewise, they mostly identify as non-religious people, supporters of prevailing the views of ordinary people against elites, and strong supporters of democratic values. They additionally tend to have little experience with unionist movements. In contrast, citizens tend to answer medium values in questions related to trust in institutions, their positioning in the political spectrum, the functioning of climate change, and the identification with human values.

The test of the four-group classification offers mixed results. Even if some clusters resemble the theoretical classification of perceptions, the alignment between empirical results and theoretical postulates is far from adequate. The cause of the mismatch is the difficulty to determine the difference between green growth and post-growth ideas, as citizens do not show conclusive perceptions in this regard. In contrast, the confrontation between individualism and

collectivism is clearer in the sample and is responsible for drawing some similarity between the theory and the results in absence of precise environmental positionings. Moreover, the distribution of individuals in these four clusters is significantly concentrated. One of the clusters gathers nearly 69% of individuals, while a second group congregates approximately 29%. A marginal cluster with inconclusive traits closes the classification.

Provided that the four-group classification is not adequate, this paper has calculated the optimal classification via the hierarchical algorithm under optimality and found 23 clusters. As far as this wide panoply of groups is concerned, the most significant insight is, again, the unequal distribution of observations between them. Three main clusters congregate 91.63% of respondents. The remaining clusters oscillate between 0.01% and 3.4% of respondents. Finding such marginal groups under a methodology based on optimality evinces the relevance that marginal clusters could have for social dynamics and political decision-making.

Considering the underlying structure of the database used to form the clusters, MCA indicates that human values have a higher explanatory capacity than sociodemographic and political variables. Caring for nature, following traditions, helping people, supporting governmental safety, creativity, considering other people's opinions, egalitarianism, independence, and fun/pleasure-seeking tendencies are more relevant than gender, the positioning in the political spectrum, the presence of children in the house or the beliefs about climate change and individual action to tackle it, among others.

These conclusions serve to further the knowledge about the role of perceptions and attitudes over the ongoing process of just energy transition and point to two lines of research and political action. On the one hand, the need to consider the marginal profiles identified in Table 4 and study their interaction with the participation processes and policies. How can marginal groups be included to define the just energy transition? On the other hand, the necessity to focus on the explanatory capacity of human values to determine the dynamics that led to the suggested panoply of groups. How can participation processes and policies be more aware of human values and look beyond sociodemographic factors such as gender and political positionings?

While the social consequences and justice of the energy transition are mainly studied through modelling techniques and quantitative indicators, the subjectivity of individuals, shaped by their perceptions and attitudes, is of utmost importance and offers a niche of research for future works under the two lines here suggested.

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