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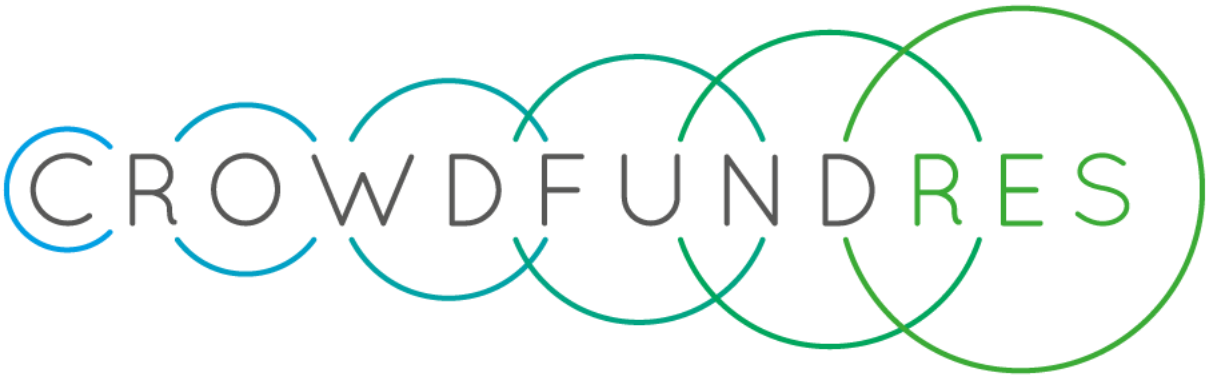

Survey of Personal Investment Choices

Characteristics of Economic Agents' Decisions in the Crowdfunding Marketplace

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CrowdFundRES
Unleashing the potential of Crowdfunding for Financing Renewable Energy Projects

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Introduction and Context

Crowdfunding now exists and is growing in the European Union, with 22 Member States having World Wide Web based crowdfunding platforms in 2015 (EC, 2016). At the end of 2014, 502 platforms were active, with over half of them located in the United Kingdom, France and Germany. An estimated EUR 4.2 billion was raised through crowdfunding platforms in Europe in 2015, with EUR 4.1 billion of these funds raised with an anticipation of financial return.

At the same time as crowdfunding has expanded and become better known throughout the European Union the renewable energy industry has been in transition with some Member States providing diminished incentives or subsidies as well as less administrative and policy support for deployment of new energy projects (EUPRS, 2016). In addition, the conventional banking system had demonstrated a lack of interest to engage and lend to smaller scale renewable energy projects.

The potential for crowdfunding to match interested private direct investors with renewable energy project developers is significant. However, a relatively minor amount of experience in matching these two interest together has occurred to date. CrowdFundRES is examining this relationship and how crowdfunding platforms can facilitate a growing amount of private direct investment into the European renewables industry.

One of the most common characteristics of persons who participate, or consider participating, in crowdfunding is the desire to invest their wealth in a socially responsible manner. In the

CrowdFundRES report summarising the findings of our survey of EU Citizens from the first phase of the project the second most important characteristic for investing was the "sustainability impact" of the investment (Bergmann et al., 2016). A majority of these same respondents also stated the model of investment, expected rate of return, technology type and stage of project development were important to their investment decision-making.

Table 1: Factors taken into account in RES Investment Decisions

Respondents taking particular factors into account in RES investment decisions	
• Transparency	213
• Sustainability impact	174
• Investment model	163
• Expected rate of return	159
• Technology type	156
• Developer reputation	132
• Time frame (duration)	115
• Geographic location	114
• Info. in native language	84
• A project in development	50
• Existing op. project	47
• Cross-border investment	29
• Others	49

Note: "Others" includes community impact, taxation, carbon consequences, technology track record. RES = renewable energy projects; CFRES = crowdfunding of renewable energy projects.
Source: Bergmann et al. (2016, p10).

This report follows up on these findings by conducting a more detailed examination of the preferences on types of investments by the respondents. The respondent group's level of financial literacy is also quantified through three questions to determine the existing skillset.

In matching private investors and renewable energy project developers the platforms are facilitating groups with divergent interests. In particular, the rate of return earned by the investors is expected to be as high as attainable given their investment preferences. The project developers are the opposite. Their objective is to acquire financing at the lowest possible cost so as to maximise profit, if a for profit enterprise, or maximise social and community benefits if a not for profit enterprise.

One part of this report investigates the rate of return on investments that crowdfund investors would expect or desire to earn given differing renewable energy project investments. By understanding how various characteristic impact investors' decision to invest, it has the potential to improve project developers financing strategies to lower costs. Crowdfunding platforms may also be able to provide better guidance and matching functions to both their clients, investors and developers.

It has been long understood that the component parts of an investment impact on an investor's decision to invest or not. The rate of return is just one such component, it is not the sole determinant of what investors consider. Pasewark and Riley (2010) examined the role of personal values in investment decisions and found that people's ethical principals do influence how they invest their wealth. Profiles of ethical investors have also been conducted to identify why they make different choices other than to maximise wealth (Beal and Goyen, 1998; Beal et al., 2005). Research has also been conducted on estimating and quantifying (monetising) the willingness-to-pay for socially beneficial goods and services (Auger et al., 2003). Previous research has been carried out to identify attributes of an investment and how this influences investor behaviour (Bollen, 2007).

The choice experiment respondents answered in the follow-up survey is a method of quantifying both the ordinal ranking of investment characteristics and cardinal ranking of those same characteristics. The cardinal ranking is based on the private investors expected or desired rate of return discount or premium given the technology, investment instrument, or stage of project development of the investment.

Methodology

The CrowdFundRES survey of EU citizens and the economic investment decisions they make was piloted during a two-week period in May 2016, from which 200 responses were received. An internet public survey company was employed to recruit the survey respondents from a broad section of the British public. The pilot study, presented in English, was limited to citizens of the United Kingdom to assure the cognitive and theoretical challenges of the survey and choice experiment would be properly managed. A brief summary of the pilot survey and its findings is presented in Appendix 1.

After analysis of the pilot survey, minor modifications were made to both survey procedures and and the questions. The final questionnaire went live on 9th June 2016. All project partners (therefore representing an academic institution, law firms, crowdfunding platforms and renewable energy firms) were requested to disseminate the internet link to the questionnaire.

As Table 1 indicates, by the end of the survey period (18th July 2016), 79 responses had been received, 28 via the direct web link to the Survey Monkey website and 51 via the embedded web link on the CrowdFundRES web page. However, 12 respondents who initiated taking the survey did not complete any questions other than indicating agreement with the terms and conditions. These responses were excluded from further analysis. Four non-European Union resident respondents who completed the survey were also excluded from further analysis. As Table 2 shows, 20.2% of the 79 responses were removed from the sample on this basis.

Table 2. Survey Response – Questionnaire Status

Questionnaire Status	Response Count
Questionnaire – Sufficiently Completed	59
No Answers or Insufficiently Completed Questionnaire	16
Non-European Respondent	4
total respondents	**79**

It needs to be noted, with a count of 59 useable responses spread over 11 countries, a country-by-country breakdown and analysis is improper to conduct. Results will be very suspect and likely create wrong impressions (i.e. invite interpretations in or inferences related to individual country contexts; whereas what we are working with is a construct of a 'European' investor, and at a higher level of abstraction and aggregation). The final useable sample comprised 59 responses. Responses were received from 11 different European countries, with the largest proportion of the sample coming from the Netherlands, France and the United Kingdom. One or two responses each came from Belgium, Cyprus, Germany, Greece, Ireland, Italy, Portugal, and Sweden.

Table 3. Country of Residence

Answer Options	Response Percent	Response Count
Netherlands	29.8%	14
United Kingdom	25.5%	12
France	21.3%	10
Cyprus	4.3%	2
Germany	4.3%	2
Greece	4.3%	2
Belgium	2.1%	1
Ireland	2.1%	1
Italy	2.1%	1
Portugal	2.1%	1
Sweden	2.1%	1
	answered question	**47**

To comply with research ethical guidelines all respondents were given the option of not answering any question. As a result, the sample size varies across the range of questions presented. This variation across questions can be seen in Table 2, with only 47 of 59 respondents identifying their country of residence.

Analysis and Results

Respondent Investment Characteristics

Questions 2 through 5 in the questionnaire enquired about respondents' investment experience, behaviour, and familiarity with crowdfunding. It is important to understand the decision making process in any household. This process becomes more complex with more decision makers. When making a direct investment decision a two-thirds majority of the respondents made the decision on their own. One-third of the respondents engaged with their spouse or partner when making a direct investment decision. A direct investment is an investment that is one made by the individual or household, as compared to an indirect investment that is determined by entrusting funds to another party who makes the decision. See Question 2 below (Table 4).

Table 4: Question 2 - Decision Maker

Who makes direct investment decisions for your household?

Answer Options	Response Percent	Response Count
Myself	67.8%	40
Other person in household	0.0%	0
Joint with spouse or partner	28.8%	17
Decline to answer	0.0%	0
Other (please specify)	3.4%	2
	answered question	59

Two qualitative responses provide some additional insight into the household decision making process. One respondent stated that he made his own decisions when dealing with his own

financial assets, but made joint decisions when dealing with joint financial assets. Another respondent stated that a financial advisor made the households investment decisions.

The respondents invited to complete the survey were primarily identified through the Survey of EU Citizens conducted earlier in the project (Bergmann et al., 2016), supplemented with further networking among the CrowdFundRES consortium members. The objective was to question persons knowledgeable of crowdfunding and alternative finance investment methods. From Question 3 (Table 5) it can be seen that the level of financial experience by the persons completing the survey was well above the average population, with over 60% of the respondents having made some sort of personal investment using crowdfunding.

Table 5: Question 3 - Crowdfunding Experience

Have you ever used crowdfunding to make an investment?

Answer Options	Response Percent	Response Count
Yes	62.7%	37
No	37.3%	22
Decline to answer	0.0%	0
	answered question	59

Nearly four out of five of the respondents indicated they had considered using crowdfunding. See Question 4 (Table 6). Again demonstrating that the group of respondents was knowledgeable of this alternative finance method.

Table 6: Question 4 - Crowdfunding Intentions

Have you ever considered using crowdfunding to make an investment?

Answer Options	Response Percent	Response Count
Yes	79.7%	47
No	15.3%	9
Decline to answer	5.1%	3
	answered question	59

The self-described investment style of respondents was dominated by two characteristics (see Question 5 below, Table 7): Socially Responsible (66.1%) and being an Intermediate-term (from 2 years up to 10 years) investor (42.4%). These two characteristics match with the assumption about persons who invest in renewable energy projects. There is a second tier of common characteristics: wanting Balanced risk (32.2%), being a Recreational investor (28.8%), investing only Occasionally (27.1%), wanting Low risk (23.7%), Funding retirement (22.0%), and being a Long-term investor (20.3%).

Table 7: Question 5 - Investing Style

Which of the following words describes your investing style (tick all descriptions that apply):

Answer Options	Response Percent	Response Count
Socially responsible	66.1%	39
Intermediate-term (from 2 years up to 10 years)	42.4%	25
Balanced risk	32.2%	19
Recreational investor (hobby to play the market)	28.8%	17
Occasional	27.1%	16
Low risk	23.7%	14
Funding retirement	22.0%	13
Long-term (greater than 10 years)	20.3%	12
Rare	16.9%	10
Experienced	15.3%	9
Novice	13.6%	8
Short-term (less than 2 years)	11.9%	7
High risk	8.5%	5
Show me the money!	6.8%	4
Other (please specify)	6.8%	4
Often	3.4%	2
Dream house	0.0%	0
	answered question	59

Respondent Financial Literacy

The group of respondents demonstrate a very high level of financial literacy. To have financial literacy means to possess knowledge and understanding of financial matters. Financial literacy in the context of this questionnaire is in connection with personal finance matters. Financial literacy may comprise of knowledge for properly making decisions pertaining to personal finance areas like investing, real estate, insurance, saving (for children's education and retirement), and personal tax planning.

The three questions asked are used to determine if a potential direct investor through crowdfunding understands the most vital of elements of an investment. Question 6 (Table 8) examines if a person understands the growth of a financial asset if it is left to grow over time. Nearly 90% of respondents gave the correct answer.

Table 8: Question 6 - Compound Interest

Suppose you had £100 (or €100) in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

Answer Options	Response Percent	Response Count
More than £102	89.8%	53
Exactly £102	1.7%	1
Less than £102	6.8%	4
Do not know	1.7%	1
Decline to answer	0.0%	0
	answered question	59

Table 9: Question 7 - Risk

Which is the riskier asset to invest in?

Answer Options	Response Percent	Response Count
A single company share	78.0%	46
A portfolio of different company shares	13.6%	8
The risk is the same	3.4%	2
Do not know	3.4%	2
Decline to answer	1.7%	1
	answered question	59

Understanding of investment risk is tested in Question 7 (Table 9, above). Being able to establish the riskiness of an investment and understanding the appropriate level of compensation given

that risk is important. It is also important to know how to reduce risk acquiring a series of differentiated investments by size, duration, and structure.

The final financial literacy question, Question 8 (Table 10), examines if a person understands the positive or negative impact of inflation on consumer purchasing power over time. This is important as it significantly influences the minimum rate of return that an investor may set for themselves, and determine the perceived attractiveness of some investments.

Table 10: Question 8 - Inflation

Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?

Answer Options	Response Percent	Response Count
More than today	3.4%	2
Exactly the same	0.0%	0
Less than today	93.2%	55
Do not know	3.4%	2
Decline to answer	0.0%	0
	answered question	59

Respondent Demographic Profile

It was expected that the group profile of those completing the questionnaire would not be representative of the general EU public. To capture the knowledge, experience and investment preferences of those who may at some point in time use crowdfunding a more distinct profile was desired. Specifically, those households that had sufficient income or savings to conduct direct investing. The level of the group 32 of 49 respondents earning €40,000 or more per year. 10 respondents had annual income in excess of €80,000 per year (Table 11).

Table 11: Annual Household Income Levels (Euros)

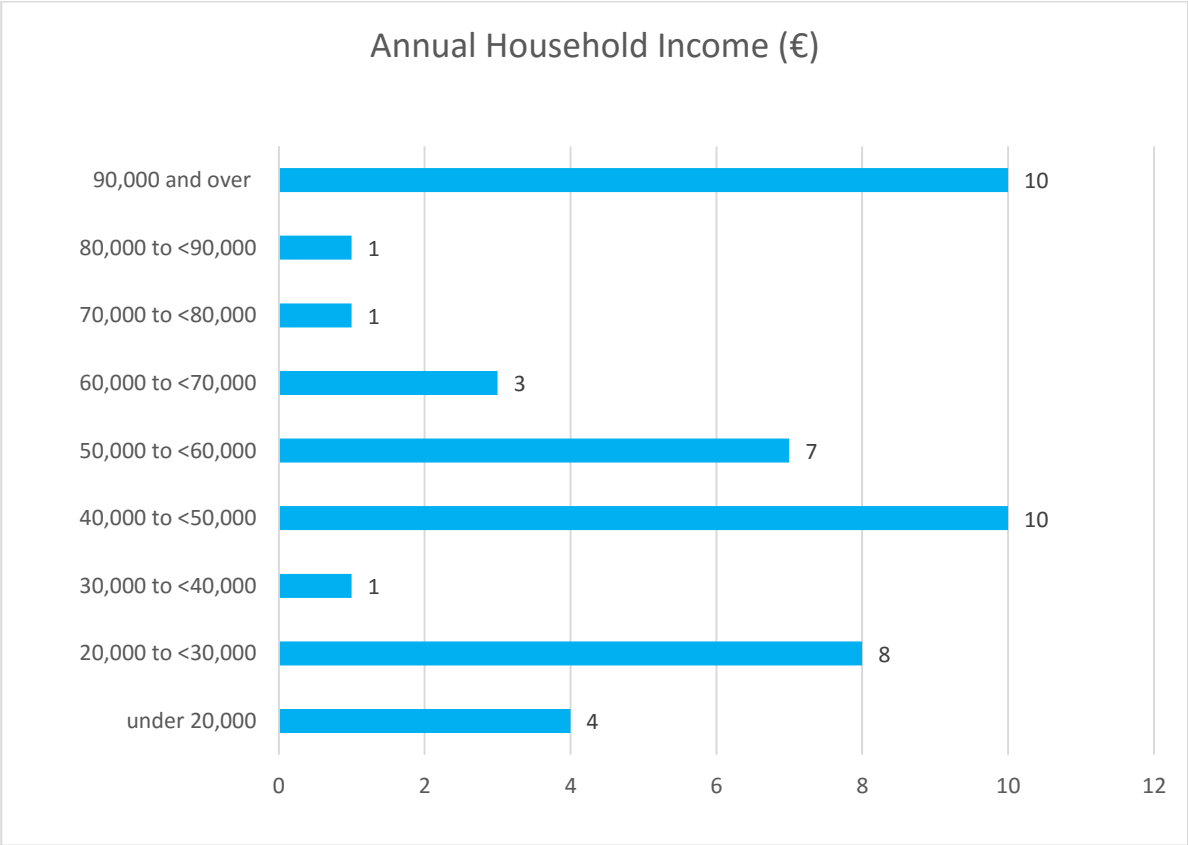


Table 12: What is your job or occupation?
(grouped from self-declared)

- Professional (Judge, Economist, Energy finance, Tax lawyer, Lawyer, Engineer, Process Engineer);
- Software & IT (IT-architect, Software development);
- Finance and accounting (Accountant, Financial advisor);
- Renewable energy industry (Rural Energy Development expert, Research Assistant, Community sustainability initiatives, Engineer in renewable energy);
- Administration and management (Middle management, Executive Project manager, Management Assistant, Administration, Service delivery manager, Virtual assistant Manager);
- Consulting (Consultant, Impact Investing Consultant, Advisor);
- Education (Educator; Lecturer);
- Other (Self employed translator; Real estate; Industrial worker; Fine artist / theatre; self-employed; pensioner).

The sample population more generally matched a generic profile of middle-class, well-educated, mid-life professional (Tables 12, 13, 14).

Table 13: Age

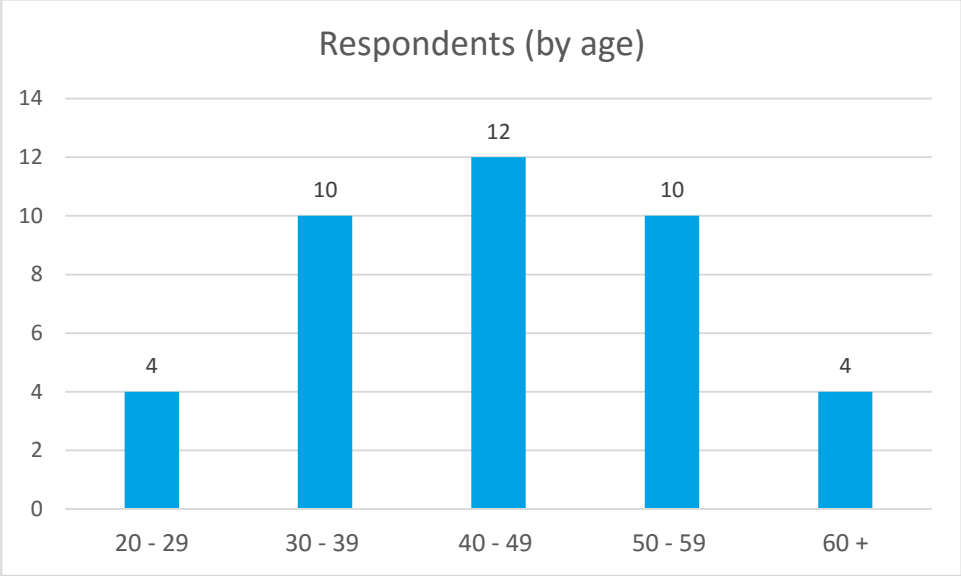
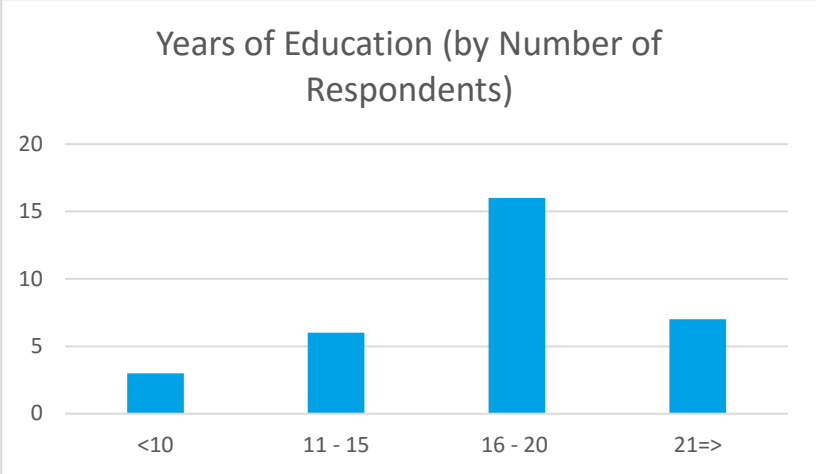


Table 14: Years of Education



In the present non-randomised sample which will exhibit therefore a self-selecting tendency, two-thirds of respondents were male. To what extent this may correlate with the distribution of household decision-making cannot be readily answered without further analysis and investigation (cf. Table 4 above). It is well recognised that alternative finance investment behaviour is gendered (e.g. Abundance, 2014; Marom et al., 2016). Male investors still dominate in this new sector, but much less so than has traditional been the case in terms of market participation and decision-making so that arguably crowdfunding displays an inclusive momentum.

Table 15: What is your gender?

Answer Options	Response Percent	Response Count
Female	27.9%	12
Male	69.8%	30
No answer	2.3%	1
Other (please specify)	0.0%	0
	answered question	43

Characteristics of Renewable Energy Projects and Investors' Preferences

The third section of the questionnaire consisted of a series of information pages about investing in renewable energy systems and hypothetical investment scenarios. The respondents are asked to indicate which of the scenarios they were most likely to invest in. By conducting the "choice experiment", it is possible to determine both ordinal ranking of different characteristics and determine the relative value of the different characteristics, cardinal rankings. Choice analysis has proven to be a very effective method of understanding different attributes and their value to consumers of many goods and services the last 50 years. It is commonly used as a pre-production market research tool to assist in understanding what goods or services need to be delivered to markets. The choice analysis questions were designed based on the extensive survey work performed in the Survey of EU Citizens and numerous contacts or interviews with private investors, as well as engagement with CrowdFundRES consortium partners (Appendix 3 provides a brief technical overview and description of the choice analysis, and some common examples of how it has been used in the past).

Ordinal ranking of important investment characteristics of a renewable energy project can be a relatively easy process by simply asking actually or potential investors what is important to them. The challenge with information gathered this way is to determine the strength of preference relative to each other. It is possible to determine not only the ordinal ranking of characteristics, but also to estimate the cardinal ranking of characteristics. Cardinal ranking means that the investment characteristic can be quantified and compared to other investment characteristics. For example, it is possible to say that one investment characteristic is twice as valuable to an investor

than a different characteristic. In this report each characteristic will be quantitatively measured by the variation in the rates of return from the investment that an investor would prefer given the project characteristics.

Three types of investment characteristics were used in the choice analysis, relating to the technology used in the renewable energy project, the type of financial investment, and the current phase of the renewable energy project. Each of these characteristics had four different sub-characteristics:

Type of Investment – Company Bonds (or loans), Project Bonds (or loans), Equity (company shares) or Community Shares (donation to community).

Type of Technology – Small Hydroelectric, Small Wind, Solar PV (community wide) or Biomass Boiler (community wide).

Phase of Project (at time of investment) – Start-up, Start of Construction, End of Construction or Operational.

Rate of Return (expected) – 3%, 5%, 7% or 9%.

Of the original sample of 59 respondents that could be used in the survey, only 48 completed the questionnaire at a satisfactory level to be included in the choice analysis. The main reason for exclusion was incomplete answers or declining to answer. With a sample size of 48 respondents who are a good representation of persons who have both the interest and financial capability to invest in renewable energy projects through crowdfunding these finding are a good indication of the preferences of similar European citizens. No one Member State dominated the sample with the Netherlands, France and the United Kingdom contributing more than one-half of the

respondents. These are also countries with significant interest in renewable energy deployment and active development of the alternative finance sector. A noticeable absence of German respondents exists but is not believed to influence the general findings. It should be remembered that the ranks and values are based on the cumulative answers given by the group, and do not reflect the preferences of any individual.

Ordinal Ranking of Investment Characteristics

In all cases, the rate of return on an investment purchased through the crowdfunding sector is the most important characteristic of any investment characteristics. The following tables show the ranking of each characteristic as inferred from the stated preferences given by the respondents. The higher the rank the more preferred by the group of respondents for investment. It is important to recall that ordinal ranking does not give any information, or make any implication as to how much more or less one characteristic is preferred. This weakness is addressed by attempts to quantify preferences and produce cardinal rankings that do quantify how much more or less an investment characteristic is preferred.

Table 16: Ordinal Ranking of Renewable Energy Technologies

Technology	
1st	Wind
2nd	Solar PV
3rd	Small Hydro
4th	Biomass Boiler

The choice analysis determined that wind and solar PV are the most preferred technologies to invest in. While Small Hydro and Biomass Boilers are less preferred. That is not to say they are not

preferred, the degree of preference is still positive, but they are simply preferred less than wind and solar PV.

Table 17: Ordinal Ranking of Investment Instruments

Type of Investment	
1st	Community Shares
2nd	Company Bonds
3rd	Project Bonds
4th	Equity Shares

The type of investment instruments can be placed in two general categorised. Community Shares are not for the direct benefit of the investor, but rather for the benefit of whichever community receives the investment. This illustrates a different form of decision criteria than the the other category which is investment for personal benefit and gain.

Table 18: Ordinal Ranking of Development Phase

Investment Phase	
1st	End of Construction
2nd	Operational
3rd	Start of Construction
4th	Start-up

The ordering of preferences based on the development phase of a renewable energy project generally matches with investment theory. The closer the project is to being commissioned the lower the risk of completion and the greater the likelihood of earnings to pay back the investor.

The next step in this choice analysis is to estimate the impact of these ordinal rankings on the rate of returns that private investors would desire to make. It is expected that the higher the ranking of each investment characteristic the lower the rate of return that is to be expected by the investor.

From the investors perspective there is a negative relationship between the rate of return desired by the investor and the desired characteristics of the investment. Investments give a lower rate of return if they provide certain desirable things like low risk or socially responsible services or products, i.e. green low-carbon energy.

All of the following tables reflect the partial rate of return value as influenced by the particular characteristic being discussed or evaluated. This can be thought of as the trade-off between an investment characteristic and the rate of return from the investment. Technically it is the marginal rate of substitution where a marginal change, i.e. change of technology, requires a change in the rate of return offer so as to compensate the investor. This exchange can be a lower rate of return in exchange for a preferred characteristic or a higher rate if it is to attract investment to a less preferred characteristic.

Table 19: Cardinal Ranking of Renewable Energy Technologies (as based on Rate of Return variances)

Technology	
Wind	1.99
Solar PV	(0.26)
Small Hydro	(1.00)
Biomass Boiler	(1.38)
(negative value – a premium rate of return)	

Cardinal Ranking of Renewable Energy Technologies (as based on Rate of Return variances)

This table shows that an energy project deploying wind technology could offer a rate of return 1.99% lower than the status quo market rate of return for a similar investment. Solar PV, Small Hydro and Biomass Boiler technologies would each have to offer an increasingly higher rate of return to fulfil the investor's desired rate. Note should also be given that the differences between

Solar PV, Small Hydro and Biomass Boiler are only a small part of the total rate of return for an investment. This is compared to a large difference between those three technologies and the lower rate of return expected for a wind technology investment. Always there is a concern for how public perception of investment have become distorted by numerous government subsidies, that have diminished or even been eliminated in the recent past across several European nations.

With a quantified rate of return premium, valued at 1.38% biomass boiler projects would have to offer a technology based premium over five times higher than a solar pv investment, which has a premium rate of return value of 0.26% (1.38% / 0.26% = 5.3). This applies only to the technology aspect of the project, not to the cumulative investment package.

Table 20: Cardinal Ranking of Type of Investment Instrument (as based on Rate of Return variances)

Type of Investment	
Community Shares	(0.22)
Company Bonds	0.30
Project Bonds	0.66
Equity Shares	0.98

Community shares would need to offer a premium to be invested in, but this is not based on market comparables but by return of benefits to the community. The other three types of investment instruments have increasing levels of risk and therefore are normally anticipated to provide a higher rate of return. From the group responses, the comparative rate on equity shares needs to be 50% greater than for an investment in a project bond. The cardinal rankings for development phase (Table 21) corroborate the ordinal findings (cf. Table 18 above), in particular in

relation to the premium rate of return expected of start-up funding, in line with the associated higher risk.

Table 21: Cardinal Ranking of Phase of Development (as based on Rate of Return variances)

Investment Phase	
End of Construction	0.39
Operational	0.05
Start of Construction	(1.08)
Start-up *	(2.16)

(negative value – a premium rate of return)

* 90% confidence level or higher

Conclusions

This study has provided both qualitative and quantitative research into the preferences of private investors in Europe who are generally knowledgeable of the crowdfunding sector and renewable energy investing. A two-thirds majority of the respondents have actually made crowdfunding investments and nearly 80% knew of and considered using crowdfunding to make an investment. The respondents came from across Europe with a majority residing in the Netherlands, France, or the United Kingdom. Therefore, the findings in this report based on that cohort are reflective of European-wide preferences and engagement with this type of alternative finance.

It is evident that a good matching service being provided by the interactions of RES developers, funding platforms and private investors. Most of the private investors described themselves as preferring to invest in a socially responsible manner, of which renewable energy projects are commonly associated. And slightly less than half of these investors identify themselves as having an intermediate time timeframe (two to ten years) for investing.

The respondents as a group have a very high level of financial literacy and are competent to be making their own direct investment decisions. They clearly demonstrated adequate knowledge to understand the choice experiment and competently express their preferences. Analysis of the respondents' choices matched with commonly held beliefs and investment theory. The understanding being that the rate of return is the single most significant and determining characteristic of making an investment. But it is not the only characteristic that determines an

investors decision to make an investment in a particular manner. The study has demonstrated that the type of technology, the development phase of the project, and the structure of the investment instrument all make partial differences to the willing of an investor to accept a lower rate of return or require a higher rate of return to make the investment.

There are several conclusions and recommendations that can be made based on the information developed by this study:

i. Efforts to increase financial literacy in the general European population should continue. Direct investing through crowdfunding requires more skills than passive investing through the conventional financial or banking sector. An increasingly financially literate population will be more likely to become part of the financial social network crowdfunding relies on as knowledge and confidence grows.

ii. Both crowdfunding platforms and project developers can be strategic in addressing their own financial objectives by designing investments that match investor's preferences better. This study has shown that all three characteristics (technology, financial instruments and development phase) can be structured to reduce or minimise the necessary rate of return offered to attract investors.

iii. Governments, local and national, should develop subsidy and incentive programmes for RES that incorporates the distinct value of different types of renewable energy projects that can be matched to the publics willingness to privately finance them. This would be most applicable to community scale projects where direct investment through crowdfunding can match both need and financial scale.

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Appendix

Appendix 1: Findings from United Kingdom Pilot Survey

The confidence level in this application does not impact on the ordinal ranking of preferences. Even when a estimated value fails the confidence level requirement the estimate remains unbiased and accurate so the relative rank of the value maintains its relative ranking position.

Table 22: Ordinal Ranking of Renewable Energy Technologies

Technology	
1st	Wind *
2nd	Small Hydro *
3rd	Biomass Boiler
4th	Solar PV *
* 90% confidence level or higher	

.

Table 23: Ordinal Ranking of Investment Instruments

Type of Investment	
1st	Equity Shares
2nd	Community Shares *
3rd	Project Bonds *
4th	Company Bonds
* 90% confidence level or higher	

Table 24: Ordinal Ranking of Development Phase

Investment Phase	
1st	End of Construction *
2nd	Operational
3rd	Start-up
4th	Start of Construction *
* 90% confidence level or higher	

Table 25: Cardinal Ranking of Renewable Energy Technologies (as based on Rate of Return variances)

Technology	
Wind	-2.40
Solar PV	1.25
Small Hydro	-1.61
Biomass Boiler	-0.75
* 90% confidence level or higher	

Table 26: Cardinal Ranking of Type of Investment Instrument (as based on Rate of Return variances)

Type of Investment	
Community Shares	0.33
Company Bonds	2.96
Project Bonds	2.11
Equity Shares	-1.28
* 90% confidence level or higher	

Table 27: Cardinal Ranking of Phase of Development (as based on Rate of Return variances)

Investment Phase	
End of Construction *	-2.61
Operational	1.19
Start of Construction *	6.06
Start-up *	1.57
* 90% confidence level or higher	

Appendix 2: Choice Cards and Supporting Information

The third section of the questionnaire consisted of the choice experiment. From this experiment, it is possible to conduct choice analysis and identify the respondent group's preferences for the characteristics being presented. As explained in the survey, the choice experiment has three steps:

> *"Step One: On the following page we are going to present a scenario where you have money to invest.*
> *Step Two: We are then going to describe different types of financial investments you could make with that money.*
> *Step Three: After that you will be presented with eight choice cards. On each choice card you will be asked to indicate which investment you would most want to make. Also, you will be asked to indicate which of the investments you consider the least desirable.*
>
> *By combining your answers with all the other answers given by people taking this survey we are able to develop an understanding of what characteristics or attributes of investments are most valuable or important to the people who have responded."*

The following eight pages in the questionnaire each had one card presented. The first card, identified as Choice Card (Blue) is presented below. The card is followed by listing of "Common Characteristics of All Crowdfunding Options" and "Investment Characteristics – Variable".

All cards were presented in the identical manner. The only variation was the choice cards, which combined 16 possible scenarios of the key attributes.

Choice Card (Blue)

CHOICE CARD			
Key Features	Option A Crowdfunded	Option B Crowdfunded	Option C Bank Savings
Technology	Solar PV	Wind	-
Annual Rate of Return	5%	3%	2.50%
Type of Investment	Project Bond	Project Bond	Savings deposit
Phase of project	End of Construction	Start-up	-

In which option would you most likely invest?

- ◯ A
- ◯ B
- ◯ C
- ◯ None
- ◯ Decline to Answer

In which option would you most likely invest?

- ◯ A
- ◯ B
- ◯ C
- ◯ None
- ◯ Decline to Answer

Common Characteristics of All Crowdfunding Options

Total Project Funds	£500,000
Duration	10 years
Transferable	No, cannot be sold. Donation to local Community Trust allowed.
Business Form	Small for profit company
Sources of Investment Funds	The project is financed through a combination of a bank loan, some equity raised directly by the company running the project, and crowdfunding.
Bank Loan	25% (£125,000) Bank is fully regulated and licensed financial institution.
Equity (shares)	25% (£125,000) Raised from original investors.
Crowdfunding	50% (£250,000) Bonds or equity investment.
Due Diligence	The bank lending money to the project conducts full due diligence. Due diligence is a systematic examination of a potential investment and serves to confirm the accuracy of all important facts in regards to the project.

Crowdfunding Platform	Established and well known platform. Operates in several EU member states.

Investment Characteristics – Variable

Type of Investment	Project Bonds (loans) Company Bonds (loans) Equity (shares) Community Shares (donation to community)
Rate of Return	3%, 5%, 7%, 9%
Type of Technology	Small Hydro Small Wind Solar Panel, community wide Biomass Boiler, community wide
Phase of Project	Start-up Start of Construction End of Construction Operational

The remaining seven choice cards are presented below:

Choice Card (Yellow)

CHOICE CARD			
Key Features	Option A Crowdfunded	Option B Crowdfunded	Option C Bank Savings
Technology	Wind	Biomass Boiler	-
Annual Rate of Return	9%	7%	2.50%
Type of Investment	Equity shares	Project Bond	Savings deposit
Phase of project	End of Construction	Operational	-

Choice Card (Purple)

CHOICE CARD			
Key Features	Option A Crowdfunded	Option B Crowdfunded	Option C Bank Savings
Technology	Small Hydro	Solar PV	-
Annual Rate of Return	9%	7%	2.50%
Type of Investment	Project Bond	Equity shares	Savings deposit
Phase of project	Start of Construction	Start-up	-

Choice Card (Red)

CHOICE CARD			
Key Features	Option A Crowdfunded	Option B Crowdfunded	Option C Bank Savings
Technology	Biomass Boiler	Wind	-
Annual Rate of Return	3%	5%	2.50%
Type of Investment	Company Bond	Community Shares	Savings deposit
Phase of project	End of Construction	Operational	-

Choice Card (Green)

CHOICE CARD			
Key Features	Option A Crowdfunded	Option B Crowdfunded	Option C Bank Savings
Technology	Small Hydro	Biomass Boiler	0
Annual Rate of Return	5%	9%	2.50%
Type of Investment	Company Bond	Community Shares	Savings deposit
Phase of project	Start-up	Start-up	-

Choice Card (Orange)

CHOICE CARD			
Key Features	Option A Crowdfunded	Option B Crowdfunded	Option C Bank Savings
Technology	Solar PV	Small Hydro	-
Annual Rate of Return	3%	7%	2.50%
Type of Investment	Community Shares	Community Shares	Savings deposit
Phase of project	Start of Construction	End of Construction	

Choice Card (Brown)

CHOICE CARD			
Key Features	Option A Crowdfunded	Option B Crowdfunded	Option C Bank Savings
Technology	Biomass Boiler	Solar PV	-
Annual Rate of Return	5%	9%	2.50%
Type of Investment	Equity Shares	Company Bonds	Savings deposit
Phase of project	Start of Construction	Start-up	-

Choice Card (Black)

CHOICE CARD			
Key Features	Option A Crowdfunded	Option B Crowdfunded	Option C Bank Savings
Technology	Small Hydro	Wind	-
Annual Rate of Return	3%	7%	2.50%
Type of Investment	Equity Shares	Company Bond	Savings deposit
Phase of project	Operational	Start of Construction	-

Appendix 3: Technical Description of Choice Analysis and Choice Experiments

The Characteristics Theory of Value and Random Utility Theory

Choice Analysis and Choice Experiments are based on two fundamental building blocks: Lancaster's characteristics theory of value, and random utility theory. Lancaster (1966) asserted that the utility derived from a good comes from the characteristics of that good, not from consumption of the good itself. For example, eating dinner at a restaurant is not just about the consumption of food but also includes the ambiance, location, what nationality of food, etc. Goods normally possess more than one characteristic and these characteristics (or attributes) will be shared with many other goods. The value of a good is then given by the sum of the value of its characteristics. Random Utility Theory is the second building block. Random Utility Theory says that not all of the determinants of utility derived by individuals from their choices are directly observable to the researcher, but that an indirect determination of preferences is possible (McFadden, 1974; Manski, 1977).

The utility function for a representative consumer can be decomposed into observable and stochastic sections: $U_{an} = V_{an} + e_{an}$ where U_{an} is the latent, unobservable utility held by consumer n for choice alternative a, V_{an} is the systemic, or observable portion of utility that consumer n has for choice alternative a, and e_{an}, is the random or unobservable portion of the utility that consumer n has for choice alternative a. Research is focussed on a probability function, defined over the alternatives which an individual faces, assuming that the individual will try to maximise their utility (Bennett and Blarney, 2001; Louviere et al., 2000).

This probability is expressed as: $P(a\backslash C_n) = P[(V_{an} + e_{an}) > (V_{jn} + e_{jn}), V_a \neq j$, for all j options in choice set C_n; a and n are as previously described; or: $P(a\backslash C_n) = P[(V_{an} - V_{in}) > (e_{in} - e_{an})], V_a \neq j$.

To empirically estimate this equation and thus to estimate the observable parameters of the utility function, assumptions are made about the random component of the model. A typical assumption is that these stochastic components are independently and identically distributed (11D) with a Gumbel or Weibull distribution.

Implicit Prices or Part-worth values

The estimated coefficients of the attributes can be used to estimate the trade-offs between the attributes that respondents would be willing to make. The price attribute (rate of return characteristic in the case of this report) can be used in conjunction with the other attributes to determine the willingness-to-pay (willingness-to-trade off) of respondents for gains or losses of attribute levels. This monetary value is call the "implicit price" or part-worth of the attribute (implicit rate of return for certain investment characteristics in this report) :

Part-worth = - (β non-market attribute / β monetary attribute)

(Or Part-worth = - (β investment attribute / β rate of return attribute) in this report)

The scaling problem noted above is resolved when one attribute coefficient is dividing by another, as in the part-worth equation, since the scale parameter in the denominator and numerator cancels out.

The Random Parameter Logit (RPL) Model

Another econometric approach is the Random Parameters Logit, which is becoming increasingly popular in applied research. In this approach the utility function for respondent n choosing over alternatives (j = 1, 2, 3…j), U_{jn}, is augmented with a vector of parameters η that incorporate the individual preference deviations with respect to the mean preference values that are expressed by vector β: $U_{jn} = C_j + \Sigma_k P_{jk} X_{jkn} + \Sigma_m \gamma_m S_{mn} C_j + \Sigma_k \eta_{kn} X_{jkn} + \varepsilon_{jn}$

where C_j is an alternative specific constant (C_j = 0, for identification purposes), X_{jkn} is the kth attribute value of the alternative j, β_{jk} is the coefficient associated with the kth attribute, S_{mn} is the m^{th} socioeconomic characteristic of individual n, and γ_m is the coefficient associated with the m^{th} individual socio-economic characteristic. Note that socio-economic characteristics are invariant across choice occasions for each individual in the sample, so are interacted with the alternative specific constant. Furthermore, η_{kn} is a vector of k deviation parameters which represents the individual's tastes relative to the average (β) and ε_{jn} is an un-observed random term which is independent of the other terms in the equation, and which is identically and independently Gumbel

distributed. The researcher can estimate β, γ and η; the η terms, as they represent personal tastes, are assumed constant for a given individual across all the choices they make, but not constant across people.

Random parameter logit probabilities are weighted averages of the logit formula evaluated at different values of 0, with the weights given by the density *f* (β). The probability that respondent n chooses alternative i is given by: $P_{ni} = f\ L_{ni}$ (B) *f* (B) *d* (B) where L_{ni} (0) is the logit probability evaluated at parameters β. Since the integral has no closed form, parameters are estimated

through simulation and maximising the simulated log-likelihood function. In order to estimate the model it is necessary to make an assumption over how the β coefficients are distributed over the population. Here we assume

that preferences for all the environmental attributes follow a normal distribution, except for the jobs and price attributes for which preferences were assumed to be homogeneous.

Appendix 4: Statistical Table for Derived Estimates

The following tables present the estimated coefficient for each characteristic tested. The first table gives the coefficient and the p-value. The p-value test is used in logistic regressions as an equivalent of the student's t-test. Put simply it is a test of rather the estimated value is non-zero. The coefficients cannot be directly interpreted as to their direct impact on the likelihood of selecting a particular investment based on a particular characteristic. The sign, positive or negative, reflects the direction of enfluence, while the relative value is comparable to other values.

Random Parameter Logit Regression Characteristic	Coefficient	P-value
Technology		
Wind	1.33	0.004
PV	0.47	0.112
Hydro	0.48	0.050
Biomass	-0.41	0.073
Investment Instrument		
Project bond	0.13	0.400
Company bond	-0.50	0.334
Community shares	1.89	0.229
Equity	0.52	0.516
Development Phase		
Start-up	-0.60	0.384
Start construction	1.04	0.606
End construction	0.95	0.432
Operational	-0.16	0.305

An implicit marginal rate of substitution can be derived by dividing on coefficient by another. In this report one of the objectives was to estimate the exchange rate for different characteristics and how that would impact on the rate of return desired or required by an investor. To determine

the confidence level of the implicit values a Wald test is conducted which produces a p-value. This are presented in the table below.

Rate of Return Value for Investment Characteristics		
Characteristic	Rate of Return Variation	P-value
Technology		
Wind	2.87	0.000
PV	-0.81	0.146
Hydro	-0.35	0.520
Biomass	0.64	0.106
Investment Instrument		
Project bond	0.39	0.569
Company bond	0.84	0.169
Community shares	-0.68	0.689
Equity	-0.59	0.285
Development Phase		
Start-up	1.34	0.060
Start construction	-0.04	0.984
End construction	-1.20	0.165
Operational	0.24	0.640