Public Awareness and Opinions Towards the Proposed River Mersey Tidal Power Scheme

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Abstract

Transitioning to a low carbon society means increasing the use of low carbon energy sources. Liverpool's Metro Mayor Steve Rotherham has plans to create a tidal power scheme, harnessing the energy of the River Mersey. Research into attitudes towards renewable energy technologies (RETs) has shown demographics such as gender and proximity to a development, can affect public opinion of proposed developments. This study used a survey distributed across Merseyside to explore public attitudes towards the proposed scheme. Results show that overall attitudes both generically towards RETs and specifically about the proposed scheme are very positive, and where opposition exists, it is rooted in concern for wildlife. Statistical analysis shows that proximity and gender don't have a significant impact on opinion; however, some trends can be observed. The results suggest there is a public mandate for the development of marine renewable energy developments.

1. Introduction

The UK government aims to drastically reduce greenhouse gas emissions by 2050. Transitioning to a low carbon society means fundamentally reconfiguring the energy system to increase the use of low carbon sources. Existing renewable energy sources have high levels of public support (Groot and Bailey, 2016). Yet developments have been dogged by vociferous public contestation by those living proximate to proposed developments, leading to a so-called social gap between national and local levels of support (Bell *et al.,* 2013). Local contestation is credited with the downward trend in planning consent, indicating that public attitudes and acceptability are integral for securing a mandate for low carbon transitions (Jones and Eiser, 2010).

The UK Government aims to have renewable energy technologies (RETs) produce 15% of energy by 2021 (UK Renewable Energy Roadmap, 2011). RETs comprised 38.9% of total energy generation from July – September in 2019 (Martin *et al.,* 2019) and 11% of the UK's total energy consumption in 2018 (Department for Business, Energy & Industrial Strategy, 2019). Therefore, significant investment is required.

Liverpool's Metro Mayor Steve Rotherham has announced plans to create a tidal power scheme that would harness the energy of the River Mersey in order to provide 0.9 to 1.5 terawatt hours of electricity a year. Developers predict this would be enough to supply electricity to ~300,000 homes (Liverpool City Region, 2019). As well as claiming to provide thousands of jobs, if successful, this project could both see the city become a global leader in tidal technology and play a key role in the city's post-COVID economic recovery (Liverpool City Region, 2020). In February 2020, £2.5 million was granted by the Liverpool City Region Combined Authority to develop a preferred option for the scheme to take forward to planning, this decision was made on the basis of a year-long study that concluded the

scheme could address any potential future energy shortfalls and support a more stable renewable energy mix (ibid.).

There is a lack of research into public attitudes towards marine renewable energy technologies (MRETs), therefore, this research project aims to provide an insight into public opinions and awareness of the proposed River Mersey tidal barrage scheme. This aim has been divided into a number of research objectives:

- To investigate public attitudes to RETs, particularly MRETs.
- To explore the relationship between demographic variables and opinions of the proposed scheme.
- To see if the proximity a participant lives to the proposed site has an effect on their opinion towards the proposed scheme.

2. Methods

Data was collected using a survey to gather a large quantity of responses required for the desired analysis. The survey was divided into three main sections (a) RETs as a whole, (b) MRETs, and (c) The proposed scheme specifically, with a section collecting demographic data. The survey comprised a variety of subjective open questions for qualitative data and closed questions for quantitative data. Proposing a variety of questions on opinions towards the proposed tidal power scheme and RETs in general, as well as requesting the outward code of the participant's postcodes to see if proximity has an effect on opinion.

Survey invitations with a link to the online Qualtrics survey were posted through doors in various postcodes, along a transect in order to explore proximity. In order to gain a representative response to the questionnaire 10 postcodes were selected across Merseyside, 5 in the Wirral and 5 in Liverpool, as shown in Figures 1 & 2. Streets within these postcodes were randomly selected via google maps. This has been proved to be a useful method of distributing surveys as shown in a review of comparison of survey responses (Yun and Trumbo, 2000).

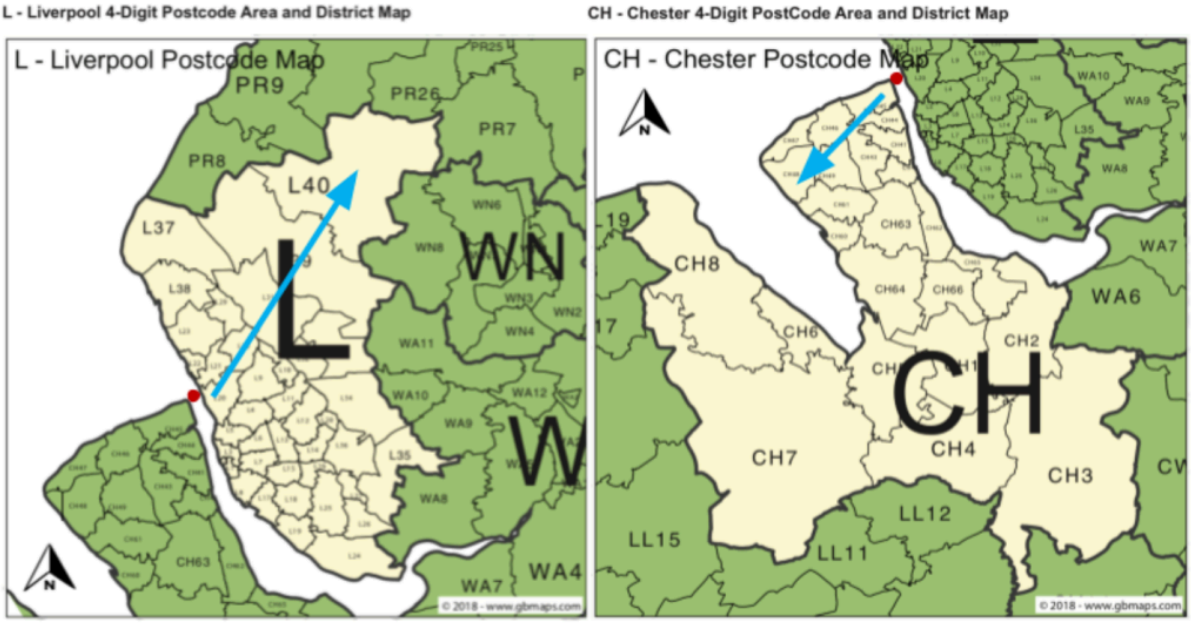

Figure 1. Maps of postcodes in Liverpool (A) and the Wirral (B). The blue arrow indications the postcodes from which samples where taken. The red dot indicates the proposed site of the scheme. (A- L20, L30, L31, L39, L40) and (B- CH45, CH44, CH43, CH49, CH48). Figure adapted from gbmaps.com

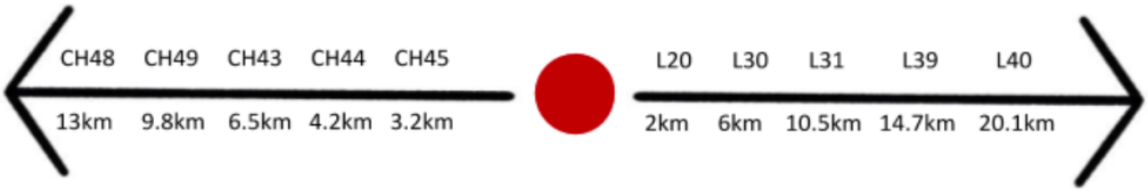

Figure 2. Distance in kilometres that each postcode is from the proposed site, represented by the red dot. Using data collected from a distance calculator (daftlogic)

Previous studies using questionnaires indicate a mean response rate for online surveys to be 35.5%, which is higher than the mean for postal surveys (29.95%) (Baruch and Holtom, 2008; and Sax *et al.,* 2010). Keeping in mind the modest response rate, a total of 700 survey invitations were posted in an attempt to secure the ~200 responses needed for the planned analysis.

There was a response rate of 29% with 203 total responses. 46 responses were removed for incomplete submission, leaving 157 viable responses. The data was then analysed using SPSS, using Spearman's Rank was as this allows a relationship between two variables to be explored (Laerd, 2018).

3. Results

This section comprises figures and statistical analysis outlining the main findings from the survey.

Demographics (%)	L20		L30		L31		L39		L40		CH43		CH44		CH45		CH48		CH49		Total for age
Gender	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
18-24	1	1	2	1	2	16	\	\	1	2	\	2	\	3	\	1	1	1	2	2	**38** (24.2%)
25-54	2	\	2	\	5	7	1	2	2	4	3	4	5	11	4	9	1	1	2	4	**69** (43.9%)
55-64	\	1	\	\	3	1	1	\	\	\	\	2	1	2	1	2	\	2	1	2	**19** (12.2%)
65+	2	3	\	2	1	\	4	\	\	\	1	\	4	1	7	2	2	1	1	\	**31** (19.7%)
Total for Gender	5	5	4	3	11	24	6	2	3	6	4	8	10	17	12	14	4	5	6	8	**157** (100%)
TOTAL	10 (6.3%)		7 (4.5%)		35 (22.3%)		8 (5.1%)		9 (5.7%)		12 (7.6%)		27 (17.2%)		26 (16.7%)		9 (5.7%)		14 (8.9%)		

Total Male: 65 (41.4%)
Total Female: 92 (58.6%)
Total: 157

Table 1. Overview of survey participants

Figure 3 shows participants levels of agreement with the statements. The figure shows strong agreement for all statements ranging from 91.7% [n=144] to 50.3 % [n=79]. A notable exception is the increased ambivalence in opinion is related to the achievability of the governments CO2 reduction target, although overall, there is still agreement for this statement at 50.3% [n=79]. Overall, the results show that the majority of participants believe the government should be switching to more renewable energy sources, working towards the 2050 carbon zero target and that there should be more investment in RETs.

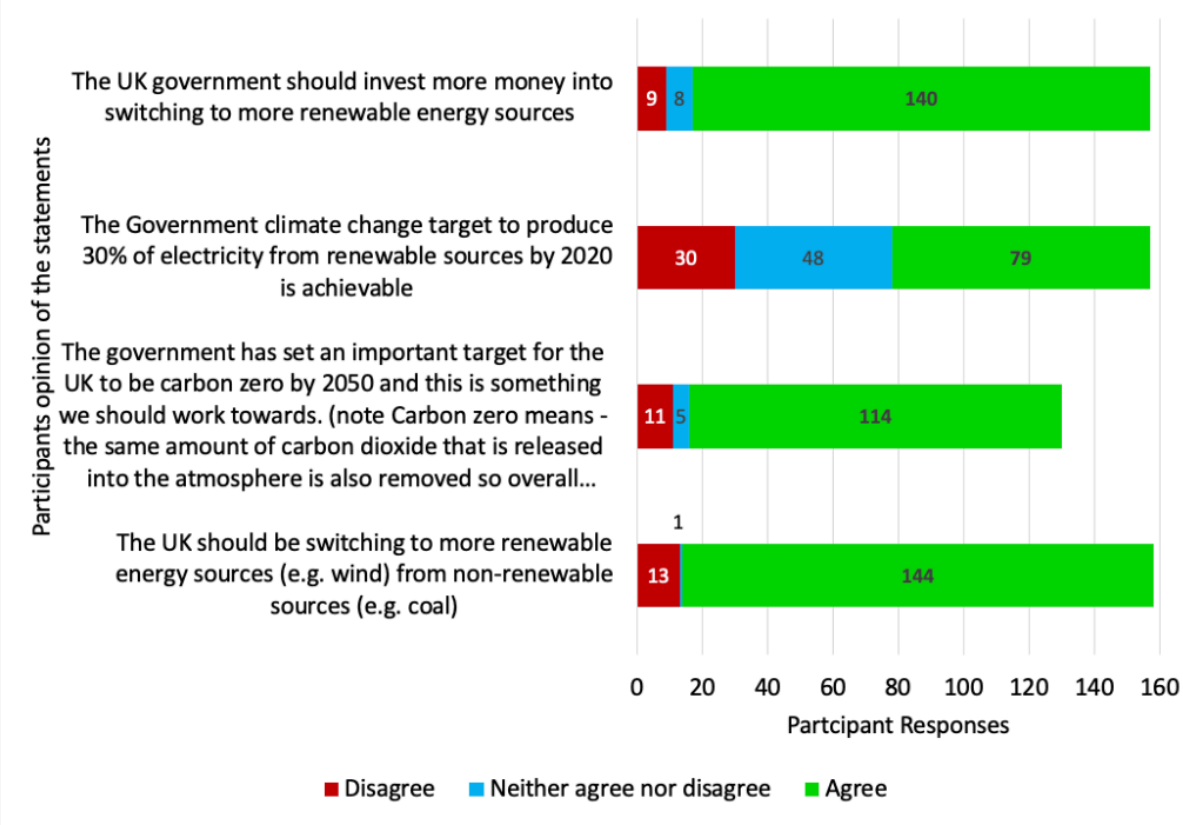

Figure 3. Number of participants who selected each answer in order to see their opinion of the statements

Figure 4 shows participants opinions of the stated energy sources. Showing all RETs were considered positive, with the exception of bioenergy which has the highest number of neutral responses perhaps indicating uncertainty. Offshore wind is considered the most positive with 87% (n=137) positive responses. The only source not to receive any negative responses is tidal energy, with 79% [n=124] positive responses. Non-renewable sources all had more negative responses than positive, with the exception of gas. Fracking had the highest number of negative responses with 79% [n=125] participants believing this to be negative.

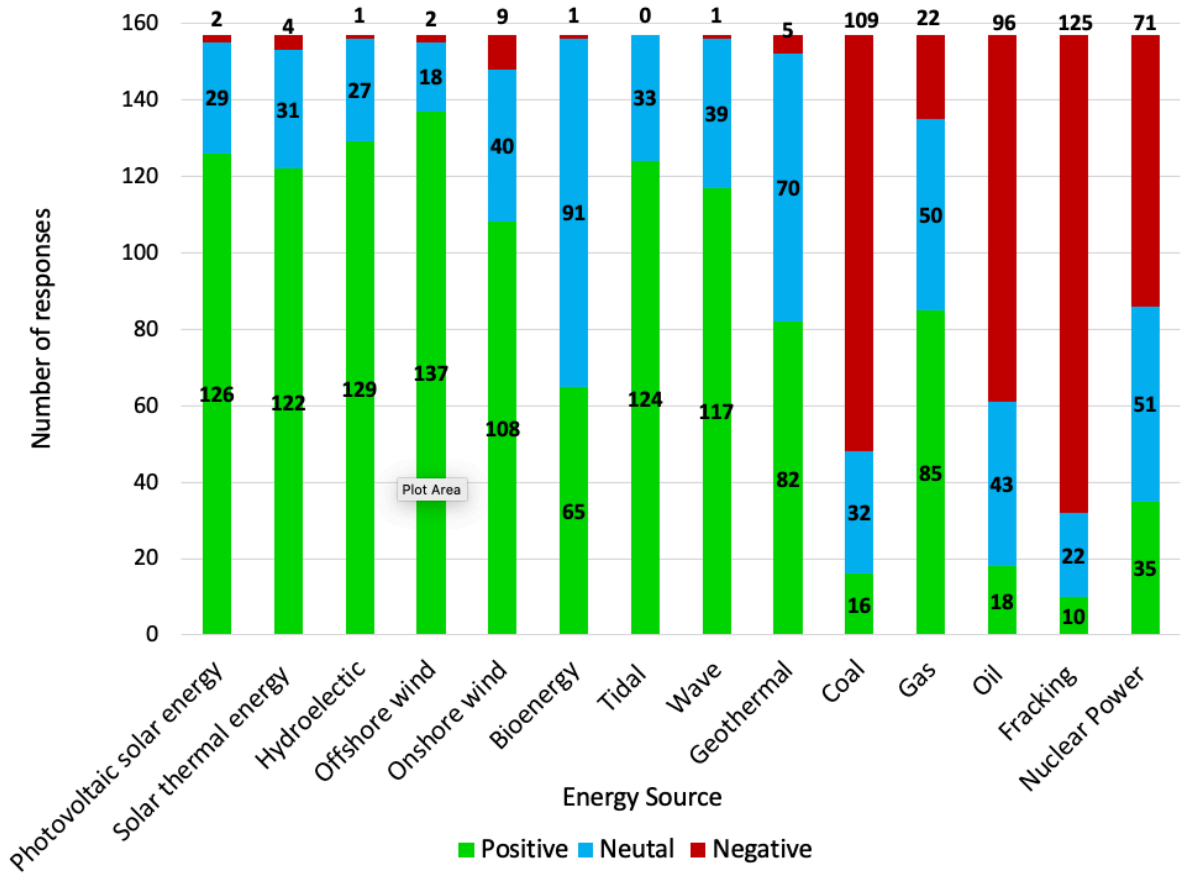

Figure 4. Number of responses of all participants' opinions of the stated energy sources. Very positive and positive are grouped as are very negative and negative

Figure 5 shows that the highest selected advantage, therefore most important according to participants is that MRETs won't run out with 18.32%, closely followed by the lack of greenhouse gas emissions with 18.17%.

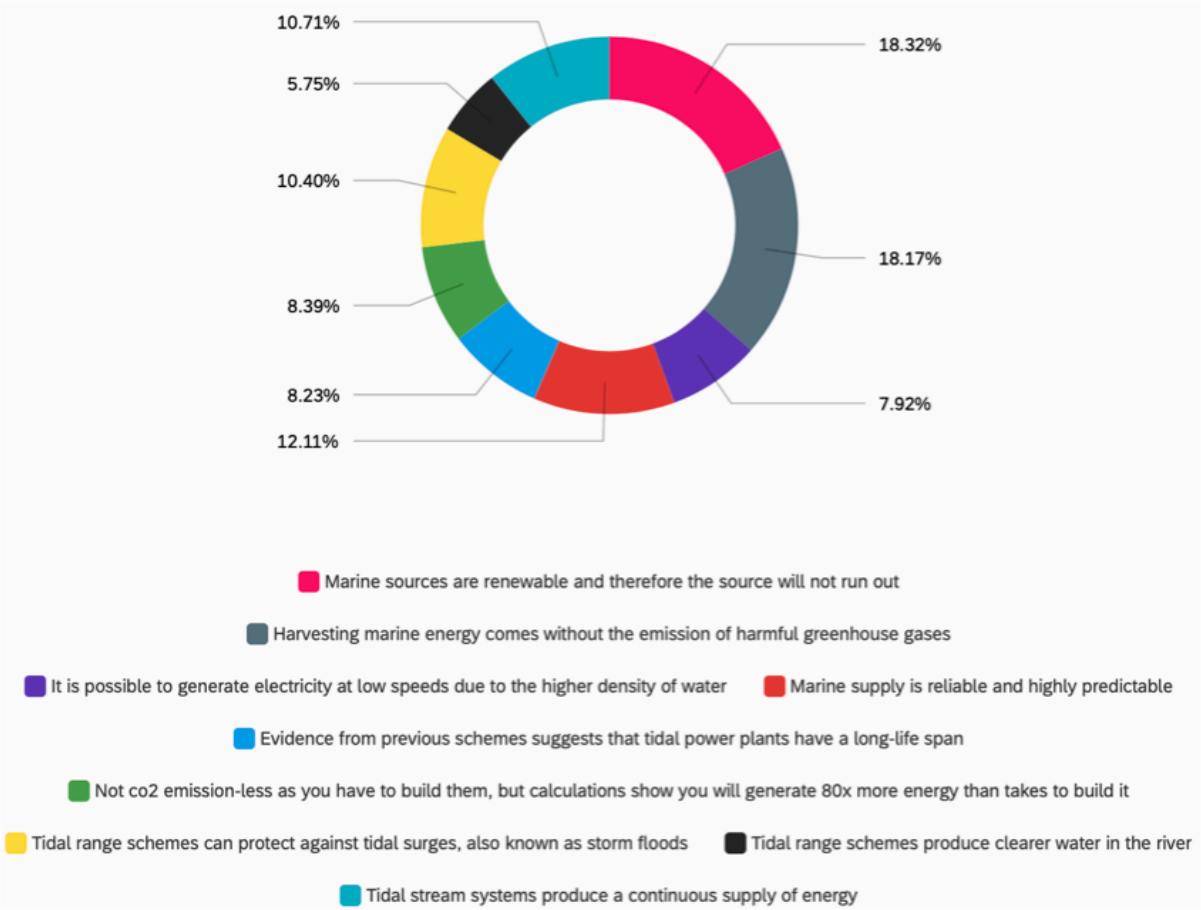

Figure 5. Percentage of each potential advantage for switching to renewable energy supplies being selected to show the respondents' most significant advantage

Figure 6 shows that the highest selected disadvantage, the most important disadvantage to participants is the potential damage to ecosystems with 33.51%, closely followed by the expense of the development with 18.59%.

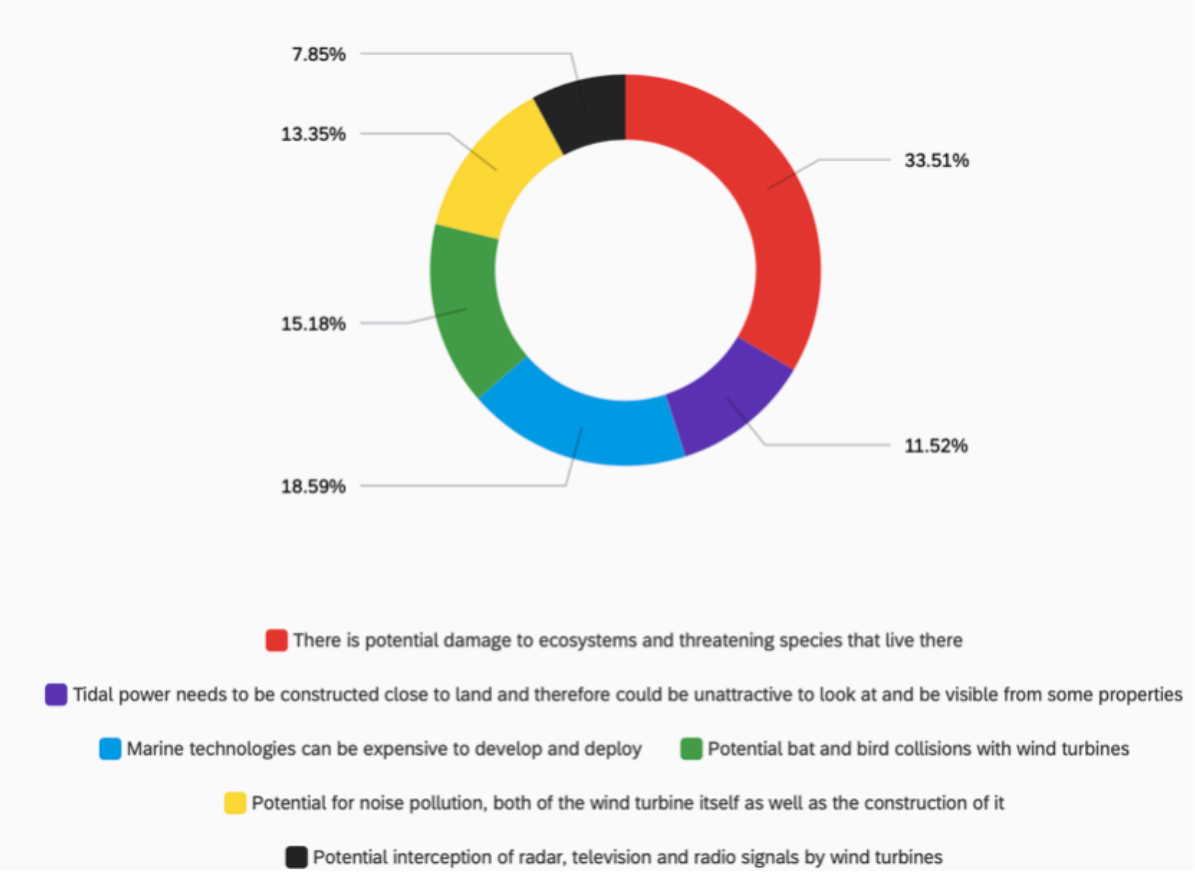

Figure 6. Percentage of each potential disadvantage for switching to renewable energy supplies being selected to show the respondents' most significant disadvantge

The final question asked participants as to whether they would vote for or against the proposed tidal power system being implemented. Looking at gender shows that 82 of the 92 female respondents would vote for the scheme with 10 voting against, and 55 of the 65 male participants would vote for the scheme again with 10 voting against. It can be determined through a Spearman's rank-order correlation test at the 0.05 significance level, that gender does not have a significant influence on whether participants vote for or against the Mersey tidal power scheme being implemented (t = 0.846, p = 0.399).

Figure 7 shows how participants would vote based on proximity to the proposed site. Showing that the majority in all postcodes would vote for the scheme, with the exception of CH48 where 56% [n=5] participants would vote against the scheme. A Spearman's rank-order correlation was run to determine the relationship between participants proximity to the proposed scheme and their vote on whether the scheme should be implemented. There was a weak, negative correlation between proximity and vote, which was not statistically significant (r_s = -.031, p = 0.870).

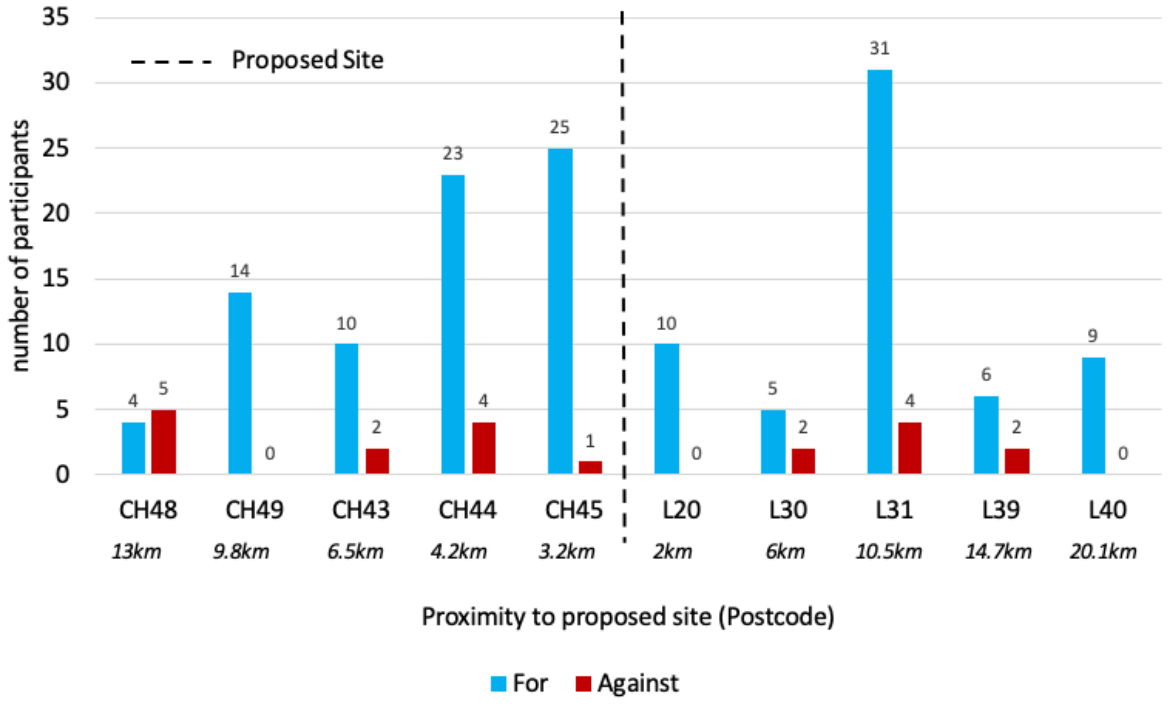

Figure 7. Number of participants per postcode who would vote for or against the system being implemented. This indicates distance from the proposed site (see also Figure 1)

4. Discussion

The results from this study show that overall the vast majority of participants believe the UK needs to do more to help fix the issue of climate change through the reduction of the countries carbon footprint and the investment in RET. Almost all participants have positive opinions of RETS with the most positive being tidal energy. The renewable energy with the most negative opinions is onshore wind but still gained more positive opinions than any of the non-renewable sources. The non-renewable forms with the most negative opinions are fracking and coal and the least negative opinions are for gas. Opinion research carried out in 1980 discovered that the most preferred renewable energy source was solar, but that non-renewable sources such as coal and nuclear were preferred over the use of renewable energy and also natural gas (Farhar, 1994). Showing that over the past 40 years the tide has changed dramatically in terms of preference towards renewable and away from non-renewable energy sources.

Some participants would vote for the proposed scheme, but they require assurances that some of the issues would be mitigated. Concerns for the scheme mainly centre around ecological impacts again shown in figure 5, where the highest selected disadvantage is that there could be damage to ecosystems. Further evidence of this finding comes from a study into public acceptance of tidal energy, which found that a significant majority of concerns stem from potential local ecological impacts (Devine-Wright, 2011).

The findings suggest that gender does not have a significant impact on beliefs, as significantly more men and women are in support of the proposed scheme than are against,

with just 12% of females and 18% of males being opposed to the scheme. These findings are reflected in an Investigation into residents' beliefs about local wind energy development, this revealed that there were no significant gender effects meaning that males and females had similar beliefs concerning the development (Devine-Wright, 2006).

A study looking into living with nuclear power and its potential risks found that proximity tends to be associated with lower levels of concern, this study confirmed that levels of perceived risk significantly decreased with residential proximity to the nearby nuclear power station (Venables *et al.*, 2012). Therefore, providing a basis for this discussion as tidal power is not considered hazardous; the proximity effect can be explored to see if the closer participants are to the proposed site, the more positive their attitude will be. This can be observed in figure 7 as the two postcodes closest to the site have an extremely high percentage of participants in favour of the proposed scheme; L20 with 100% and CH45 with 96%. The percentages then decrease with the distance from the site. In Liverpool the percentages decrease to 71% in L30, 89% in L31, 76% in L39 but then rises again to 100% in L40. This is similar in the Wirral with the percentage dropping to 85% in CH44 and then 83% in CH43. However, the percentage increases to 100% in CH49 and then decreases again in CH48 to the lowest level of support, just 44%. This is an example of 'inverse NIMBYism' (not In my back yard) as described in a study looking at understanding public attitudes about renewable energy facilities, where those closest to the development or have it 'in their backyard' are the most likely to be in support of it (Warren *et al.,* 2005). The responses for The Wirral displayed a negative correlation between postcode and vote, suggesting proximity does not pose a significant effect statistically.

5. Conclusions

In conclusion, the findings show that overall public attitudes towards the proposed River Mersey tidal power scheme are generally very positive. There is overwhelming support for the proposed scheme with 87% of participants voting in favour of the scheme if given the chance. Participants generally feel strongly that there needs to be more investment into RETs, in order to meet the UK's 2050 carbon target.

Exploring demographic variable effects on public opinions of RETs and MRETs, found that gender and proximity do not seem to have an effect on participants opinions. However, with just having 157 responses there were small numbers in each category once separated out. Therefore, to gain more accurate results for future study, more participants for each category is needed.

This research provides the basis for further investigation into public attitudes into MRETs regarding grounds for both opposition and support. Exploring further into how different demographics can affect public opinion and conducting a wider study to gain a greater understanding of the proximity effect and 'inverse NIMBYism'.

Results show that overall public attitudes both generically towards MRETs and specifically about the proposed local River Mersey tidal power scheme are very positive, and where opposition does exist it is rooted in concern for wildlife. Conclusively the results suggest that

there is a significant public mandate for the development of non-visible marine renewable energy developments.

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7. Ethics

This dissertation was given ethics approval by the Department of Environment and Geography's ethics committee on: 10/09/19

8. Acknowledgements

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