Community perceptions of new greenspace interventions: a case study in Rhyl in North Wales

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Community perceptions of new greenspace interventions: a case study in Rhyl in North Wales.

Report to Denbighshire County Council, December 2023.

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1. Executive Summary

This collaborative project between Bangor University, the UK Centre for Ecology & Hydrology (UKCEH) and Denbighshire County Council (DCC) sought to analyse the ecosystem benefits of delivering the Climate and Ecological Change Strategy of DCC, as well as the community's perceptions of these environmental changes happening in their neighbourhood. The coastal town of Rhyl was used as case study and the project compared Rhyl residents' thoughts against a nationally representative sample of the United Kingdom. UKCEH ran five ecosystem service models to calculate the benefits of existing and planned green infrastructure (GI) in Rhyl. Bangor University developed a 5-minute online survey to gather social data on perspectives from across the UK on tree planting and establishing wildflower meadows and assessed the Rhyl community's perceptions of these environmental changes compared to the UK sample. Through individual interviews with Rhyl residents, Bangor University gathered more comprehensive insights on the communities' reactions to Denbighshire County Council's GI projects. Based on Denbighshire data the ecosystem service models revealed that one hectare of trees can provide an economic value of up to £3,669 for noise, air pollution and carbon, if planted in the right places. These data are also useful for cities. For example, providing performance figures for one hectare of trees allows council officers to add up the multi-functional benefits and plan future greening in their location. The social data revealed that people are ready for change and that it is a misconception that people are hesitant to adopt GI. We found that people in Rhyl seem to want more trees than the national average, although this might be related to how participants self-selected to contribute to the study. While the Council has previously heard from unhappy residents in response to environmental changes, our study showed that these voices were the minority and that the vast majority of Rhyl residents who engaged with our research not only supported tree planting and establishing wildflower meadows, but also offered specific suggestions as to where this would be most welcome, and many wished to engage with the process. Our recommendations based on this research are:

- Consider tree planting at sites highlighted by Rhyl residents at interview. 25% of interviewees said that they would like to see coastal-tolerant trees along the promenade. 25% would like more trees around the town centre.
- Consider establishing wildflower meadows at sites highlighted by Rhyl residents at interview. 18% of interviewees said that they would like to see wildflower meadows along the promenade. Brickfield Pond, Marine Lake, Drift Park and Llys Brenig were also mentioned as possible new sites by interviewees.
- More emphasis in marketing materials or signage about the benefits of wildflower meadows for bees and butterflies. Care for bees was widely mentioned in interview and in free-text survey responses.
- Scatter flowers in the wildflower meadows to add colour to the grasses. Several interviewees said that this would increase acceptability of the sites among residents. Two interviewees said that they would like to see native flower species**.** Consider changing terminology to 'biodiversity meadows' may help better convey what they look like, and their main purpose.
- 100% of Rhyl residents interviewed said that health and well-being was important to them. Helping residents understand the health and well-being benefits provided by greenspace may lead to increased support for Denbighshire County Council's GI projects.

1.1 Headline Results

- The vast majority of those surveyed (> 70%) and interviewed (> 80%) are in favour of green infrastructure (GI) schemes (in this case, tree planting and wildflower meadows).
- Perceptions around trees and wildflower meadows did not differ when people were given additional information about the benefits they provide, suggesting that one-off information campaigns tend not to change people's existing perceptions.

- A large majority of Rhyl interviewees are very interested in Denbighshire County Council's GI schemes, and most would like to be part of the process to engage with the Council and have their say. 89% of interview participants said that they would like to get involved in tree or wildflower meadow activities in Rhyl.

- Mental health & wellbeing and bees were the most cited benefits by people who were surveyed or interviewed.

Surveys:

- An on-line questionnaire survey was conducted with 1866 people across the UK, and 60 in Rhyl.
- There was overwhelmingly positive perception of trees and wildflower meadows with over 70% of respondents across both national and Rhyl survey stating they wanted more trees and wildflower meadows in their neighbourhoods.
- Respondents in Rhyl showed significantly greater positive perceptions about trees than the UK average.
- The most preferred (> 70%) locations for trees across the national and Rhyl surveys were rural areas and parks while the least preferred (45%) were along walking and bicycle routes. The national survey indicated the most preferred (> 65%) locations for wildflower meadows were rural areas and parks while the least preferred (45%) were city or town centres. The Rhyl survey indicated the most preferred (> 80%) locations for wildflower meadows were rural areas and along walking and bicycle routes while the least preferred (60%) were city or town centres.
- In the national survey there was a positive relationship between more affluent areas and positive views on trees and wildflower meadows. In Rhyl this relationship was reversed and deprived areas returned higher rates of wanting more trees and wildflower meadows.

Interviews:

- 28 in-person interviews were conducted in Rhyl. Participants were recruited by wide dissemination of invitations, social media, word-of-mouth, and direct communication. This encouraged both supporters and critics of the Council's actions to participate.
- Rhyl residents overwhelmingly supported GI schemes of this kind. Those that were against planting more trees or establishing wildflower meadows were a small minority.
- 100% of participants said that trees improve the visual attractiveness of the area and 96% of participants stated that trees and wildflower meadows mattered to them.
- 96% of participants said that they did not believe there was any place in Rhyl that had too many trees and 89% of participants said that they did not believe there was any place in Rhyl that had too many wildflower meadows.
- 82% of participants thought that more trees and more wildflower meadows would be good for the community.
- 82% of participants stated that it was important to spend time among trees. 68% of participants stated that it was important to spend time among wildflower meadows.
- Health and wellbeing benefits were important to 100% of respondents. Biodiversity benefits were important to 96% of respondents. Carbon storage benefits were important to 57% of respondents.
- 89% were interested in taking part in tree or wildflower activities or to maintain them as safe and clean public places.

As a result of the project, Rhyl residents gained greater awareness of the local GI plans, the benefits and relevant contact information, including ways to take part and to maintain new GI sites as safe and clean public spaces. The results of this trans-disciplinary study will inform guidance to support both councils and residents through improved future design of local GI.

With thanks to the staff of Rhyl Library & One Stop Shop for allowing use of the interview room, for displaying project promotional posters and for their support in participant recruitment.

2. Project Overview

This project accompanied planned greenspace interventions in Rhyl, a coastal town which experiences many urban challenges. As part of its Climate and Ecological Change Strategy, Denbighshire County Council (DCC) is developing new green infrastructure (GI), including tree planting and urban wildflower meadows in Rhyl. The research team from Bangor University and the UK Centre for Ecology & Hydrology (UKCEH) worked in partnership with DCC to model the benefits of existing and planned green infrastructure in Rhyl and assess the community's perceptions of these environmental changes happening in their neighbourhood. UKCEH quantified and compared the benefits of two planned and four existing GI schemes and calculated ecosystem service values based on UK and Rhyl data for noise, carbon, and air pollution removal.[1]

Alongside the ecosystems service values examined by UKCEH, Bangor University developed survey and interviews to gather the public's thought of GI initiatives. The survey and interview questions were designed to address the research questions:

1) Whether the type of new GI affects its acceptability and people's engagement.
2) Whether the provision of specific information about co-benefits change perceptions and engagement.
3) To what extent the perceptions of residents in Rhyl reflect perceptions across the UK.

The project conducted a large UK-wide survey to gather nationally representative responses about tree planting and establishing wildflower meadows. Respondents were asked to consider these GI initiatives from the perspective of their local area and as though delivered by their own local councils. Half of the participants received additional information about the benefits of trees and wildflower meadows ahead of the questions, allowing the researchers to assess whether providing this information affected perceptions, and whether such key facts would be reproduced in the free-text responses. To assess the community's perceptions of these environmental changes happening in the small town of Rhyl, the online survey was also shared with Rhyl residents to compare views concerning benefits and decision-making and evaluate them against the wider views of the UK population. Additionally, in-person interviews with residents were conducted to identify people's perceptions of GI benefits, (mis)conceptions of reasons and rationales behind schemes of this kind, and sentiments concerning decision-making processes.

[1] The sites were: Coronation Gardens (new woodland); Olivia Drive (new wildflower meadow); Holly Close (new wildflower meadow); Hilton Drive (existing wildflower meadow); Rugby Club Walkway (existing wildflower meadow); Maes Gwilym (existing woodland).

3. Methods

3.1 CEH Modelling information

UKCEH urban ecosystem services models were run or adapted from previous studies to calculate the likely benefits of new trees. These calculated the likely benefits you get from a hectare of trees, in terms of the physical benefit and the economic value from addressing three common urban challenges: reducing noise pollution, reducing air pollution and storing carbon. This information was presented to a subset of participants, together with a more detailed explanation of what those benefits mean for people or the environment. See Appendix III.

Benefits for noise were calculated from a study conducted in Birmingham which assessed different locations for tree planting around the city, comparing random planting of trees on any available grass, and more targeted tree planting in areas which receive the most noise (i.e., between residential buildings and busy roads).

Benefits for air pollution were taken from UK modelling by UKCEH, drawing on results for Denbighshire and adapting to calculate the benefits for a single hectare of trees. The results summarise the total quantity removed by trees for five pollutants: ammonia (NH_3), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10}, which also includes the fraction that is $PM_{2.5}$) and sulphur dioxide (SO_2).

Benefits with respect to carbon storage were taken from the UK Natural Capital Accounts, estimating a value for a hectare of trees in terms of the total carbon stored in their trunk, branches and roots.

3.2 Surveys and Interviews

Social research methods were used to gather people's thoughts on planting trees and establishing wildflower meadows. The social research used the following research techniques:

- Literature review to inform survey and interview questions.
- Policy context in relation to DCC planned green infrastructure.
- A five-minute online questionnaire shared to a nationally representative sample of 1866 respondents (April 2023) via digital insights specialists Cint.
- The survey was also completed by 60 Rhyl residents recruited through Bangor University (May–August 2023).
- Structured interviews with 28 Rhyl residents (June–August 2023).
- Semi-structured interview with one focus group of six Rhyl residents (June 2023).

A total of 1926 respondents completed the online survey (96% of 2000 target). The national survey was designed to capture a representative sample across ages and genders. It returned 1866 respondents: male (N=915), female (N=944) and 4 respondents preferred not to say and a further 3 identified as other. The breakdown by age is detailed in Table 1:

Table 1. National online survey responses by age group

18-24	25-34	35-44	45-54	55-64	65+
193	317	298	314	300	444

The Rhyl survey returned more female respondents (N=45) compared to male (N=15), and a higher proportion in the older age groups as detailed in Table 2:

Table 2. Rhyl online survey responses by age group

18-24	25-34	35-44	45-54	55-64	65+
2	6	4	16	15	17

Half of each online survey sample received an additional paragraph about GI benefits and half did not receive any benefits information. In Rhyl this resulted in 30 responses with benefits and 30 without and in the national survey 931 responses with benefits and 935 without. This was to find out whether receiving information about GI benefits affected perceptions and acceptability. A copy of the online questionnaire can be seen in Appendix I.

The ways in which participants were recruited to complete the surveys (national versus Rhyl) differ. National participants were invited to complete the survey because they had signed up to online survey schemes and as such were rewarded (points-based and/or cash-incentivised) for completing the questionnaire. They therefore did not self-select to participate based on a specific interest in the environment or GI. The Rhyl participants were recruited by Bangor University via Rhyl Facebook groups, promotional posters, signage in the Rhyl Library and word of mouth by library staff, and postal invitation. It can therefore be expected that the Rhyl participants were prepared to think about environmental matters ahead of choosing to complete the survey, as they opted to complete it after reading the promotional materials; the national respondents did so because they chose to complete surveys on a range of different topics to earn the associated rewards. The Rhyl participants were invited by the question ‘Do you live in Rhyl – share your thoughts on environmental changes’ to minimise responses by ineligible respondents who did not live in Rhyl. The national survey did not ask a similar question. Together the additional cues given to the Rhyl participants meant that they knew the survey was about the local GI schemes in Rhyl ahead of the questionnaire, which could lead to people choosing to complete the survey because of their interest in the subjects (either of Rhyl as place or of the topic of green infrastructure, or both). The national respondents were answering the survey questions without comparable prior knowledge.

In addition to invitation to complete the online survey, the promotional information for Rhyl residents also extended an offer to take part in the paid interviews (£10 in cash). At the end of the online survey those who were interested in taking part at interview were invited to leave their contact details to register. 28 Rhyl residents (93% of target sample of 30) took part at interview and one focus group of six residents were interviewed separately. The interviews were held in-person with audio recorded and lasted approximately one hour. A copy of the interview questions can be seen in Appendix II. Half (14) of the interviewees received additional benefits information about GI schemes ahead of the interviews and half (14) did not. A copy of the additional benefits information from both the survey and interviews can be seen in Appendix III. Of the 28 interviewees, 26 also completed the online survey. Two did not complete the online survey as they were not IT literate and at that time paper copies were not available. Participants were recruited as follows:

- 14 via the online form promoted on social media.
- 5 via the Researcher in person at the library.
- 6 via posters displayed in the library/library staff.
- 3 via word of mouth.

The demographic background of interview participants is detailed in Table 3.

Table 3. Age and gender of interview participants

Age	**Male**	**Female**
18–24	1	0
25–34	1	2
35–44	0	1
145–54	2	4
55–64	2	6
65+	2	7
Total	**8**	**20**

Table 4. Highest level of education

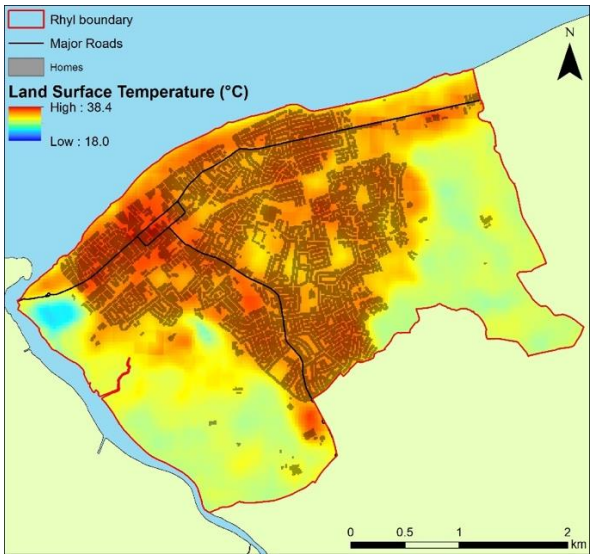
Qualification	**Number of Participants**
Unknown/prefer not to say	3
No formal qualifications	2
Secondary school (GCSE, O-Level or equivalent)	2
Higher secondary or further education (A-Level, BTEC or equivalent)	9
University degree (undergraduate)	9
Postgraduate degree	3

The focus group was a self-selected group of residents who, having heard about this study, contacted the Researcher as they were keen to share their negative views of the wildflower meadow established by their homes. These interviewees did not complete the online survey on the day nor via the email shared with them, nor return the paper copies sent to them via post. We therefore do not have comparable data on these residents other that they identified as five females and one male.

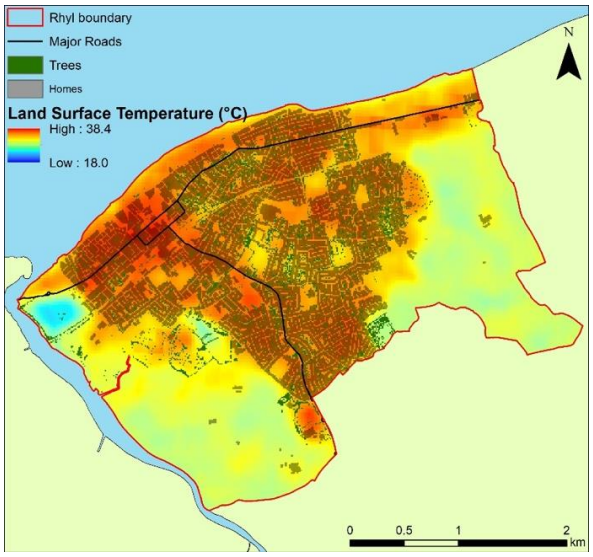
4. Results

4.1 Results of ecosystem services modelling assessments

The modelling assessments delivered by UKCEH make locally relevant calculations of the benefits from trees and wildflower meadows in Rhyl. For example, Figure 1 shows the land surface temperature for Rhyl, with and without tree coverage.



Land surface temperature (LST) from LandSat-8, for Rhyl, with residential buildings and major roads displayed for context.



Land surface temperature (LST) from LandSat-8, for Rhyl, with residential buildings, trees, and major roads displayed for context.

Figure 1. Land surface temperature models for Rhyl, with and without trees

Model calculations for the benefits of noise mitigation, removal of air pollution and carbon storage provided by trees were calculated. They were presented to interview participants to give them information on the benefits that trees and wildflower meadows provide (Table 5). One hectare of trees (approximately one and a half football pitches) can provide the following benefits, with greater benefits for some services (like noise mitigation), if planted in the right place.

Table 5. Modelled economic value of health benefits provided by trees

	Health Benefit	**Modelled economic value**
Noise	Wider strips of trees can reduce noise from roads. Lower noise levels result in less stress for residents, in turn giving health benefits such as a reduced risk of heart attack.	£887 in benefit from reducing road noise (for typical urban trees, but up to £2,165 if planted in key locations near to roads).
Air pollution	Trees remove air pollutants, especially fine particulate matter which is extremely damaging to human health. Lower air pollution concentrations, lead to a reduced risk of health effects such as heart attack, breathing problems and reduced life expectancy.	Removes 97 kg per year of air pollutants, with a value of £145 (based on data for Denbighshire).
Carbon	Trees store carbon in their trunk, branches and roots.	Holds 5.04 tonnes of Carbon, with value of £1,359.

The economic values for noise benefits use European policy guidance on the cost of high noise levels for impacts on health and annoyance. Exposure to high noise levels can lead to hypertension and a range of adverse health impacts, including increased risk of heart attacks. The economic values for air quality benefits are based on UK government guidance for policy appraisal and relate to the relative risk of air quality impacts on respiratory hospital admissions, cardiovascular hospital admissions, Life Years Lost and increased mortality rates. The figures for noise and air pollution are annual figures, i.e., they provide that amount of value per year. Carbon is valued based on the quantity of carbon stored in a tree.

4.2 Survey Results

Questions 1 to 6 captured respondents' demographic data. Question 7 asked participants about their personal interest in environmental matters.

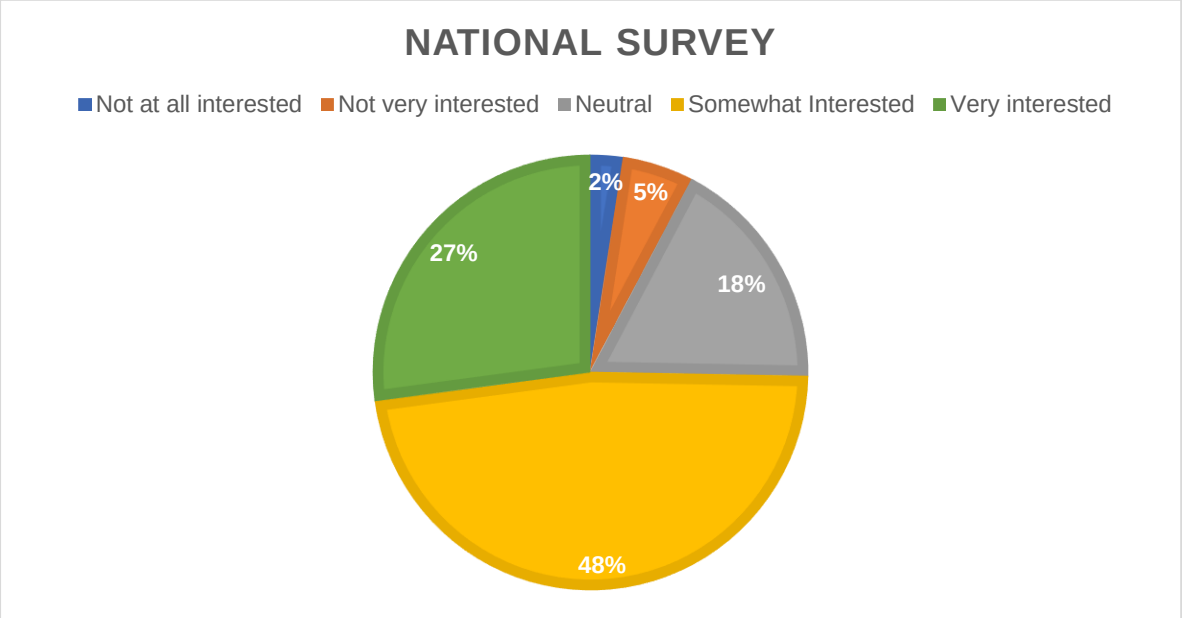


Figure 2. National survey responses to rating personal interest in environmental matters

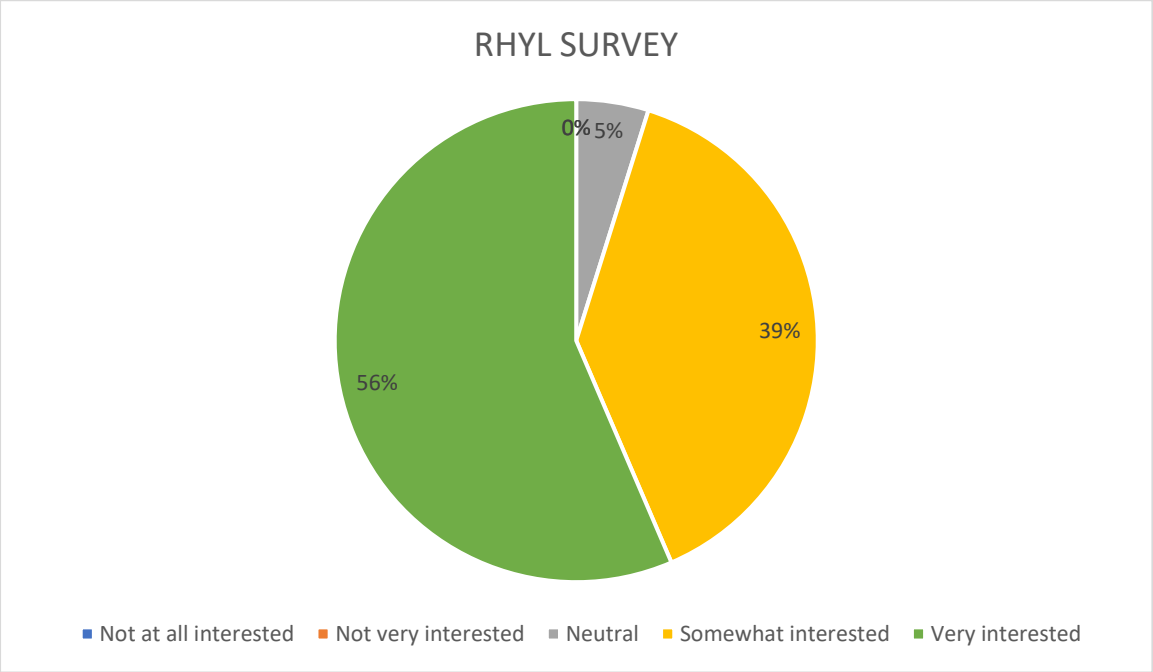


Figure 3. Rhyl survey responses to rating personal interest in environmental matters

Figure 2 shows that almost half of the national survey sample were somewhat interested in environmental matters. Over a quarter at 27% rated themselves as very interested in environmental matters. 7% selected that they were either not at all or not very interested. The Rhyl survey as shown in Figure 3 returned overwhelmingly higher positive responses with 95% of respondents stating that they were either somewhat interested or very interested in environmental matters. No respondents stated that they were either not at all or not very interested.

Questions 8 to 14 asked participants about their thoughts of planting new trees and establishing new wildflower meadows in their neighbourhood.

4.2.1 Respondent preferences on changing tree and wildflower meadow coverage locally

These questions invited respondents to consider changing tree (Q8) and wildflower meadow (Q9) coverage in their local area (see Appendix I for question formulation).

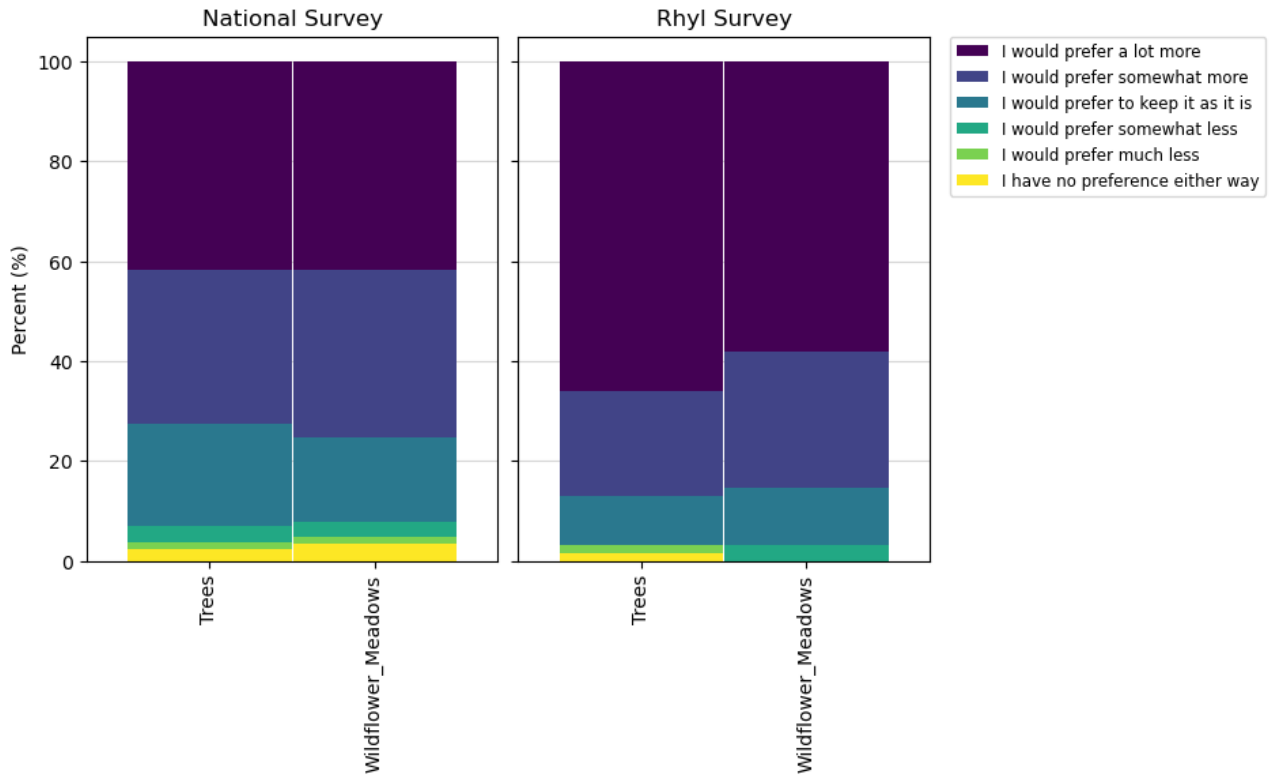


Figure 4. Survey responses for changing tree/wildflower meadow coverage

Figure 4 shows the responses to changing tree and wildflower meadow coverage. It shows positive response rates from both national and Rhyl surveys, with an overall higher preference rate from Rhyl. The higher overall preference rate in Rhyl relative to the national sample, using a Mann-Whitney U test, prove to be statistically significant. This is true for both trees ($p < 0.001$) and wildflower meadows ($p < 0.05$). Further analysis of questions 8 and 9 shows disparities in preferences by gender, age and deprivation, outlined below in Figures 5 to 7.

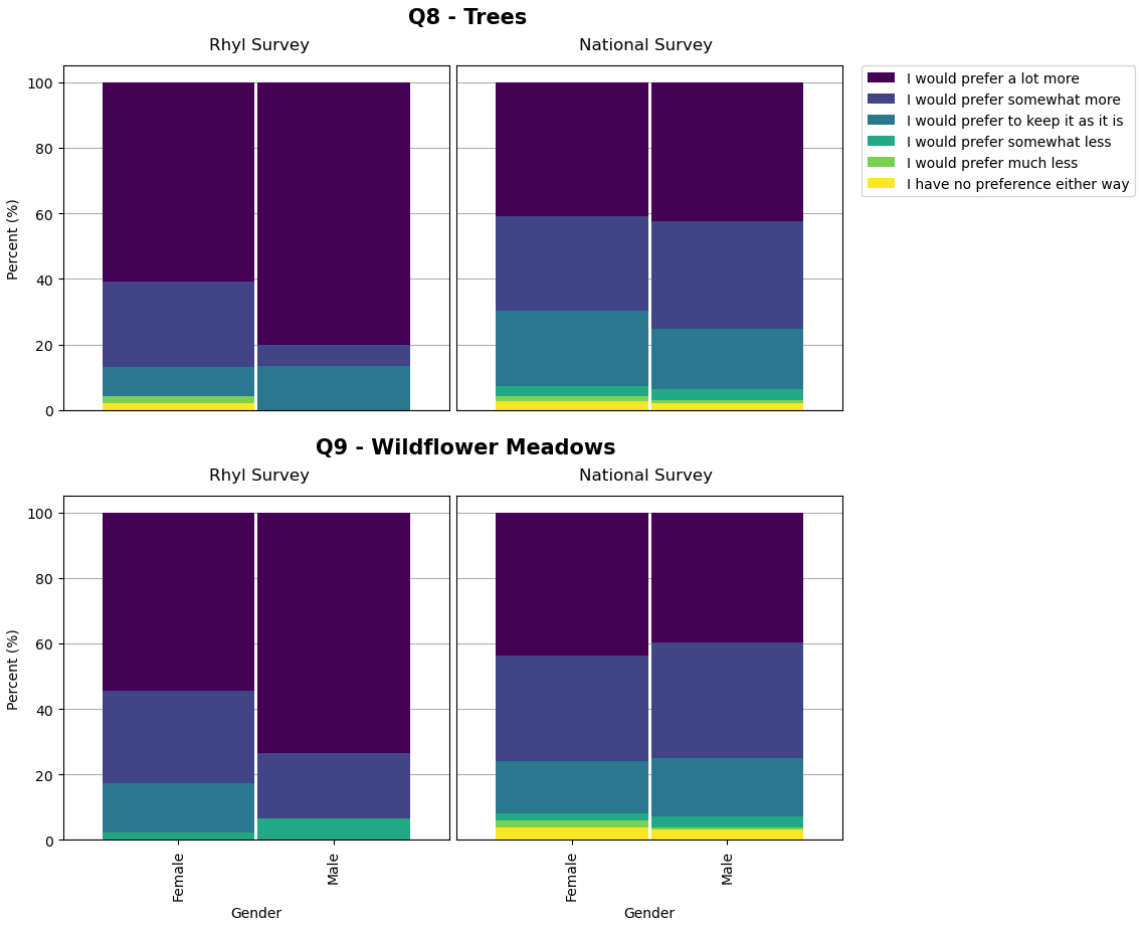


Figure 5. Q8 and Q9 by gender (excluding 'other' and 'prefer not to 'say')

In the national survey, Figure 5 shows that the preferences for trees and wildflower meadows for both male and females are very similar, with the slightest difference being males more in favour of planting much more trees and females in favour of planting much more wildflower meadows. in our analysis those who identified as other or preferred not to say were omitted due to low sample size For the Rhyl survey, there is a notable difference between gender, with a higher proportion of males wanting much more trees and wildflower meadows. Compared to the national survey, the proportion of both males and females in Rhyl, wanting more trees and wildflowers, is higher. In Q8, these differences in preferences for trees for both males and females between the national survey and Rhyl is statistically significantly (males = $p < 0.05$, females = $p < 0.01$). However, in Q9, the only statistically significant difference in preferences for wildflowers between the national survey and Rhyl is for males ($p < 0.05$). Whilst the preference for more wildflower meadows is higher for females in the Rhyl survey relative to the national survey, the difference is not statistically significant.

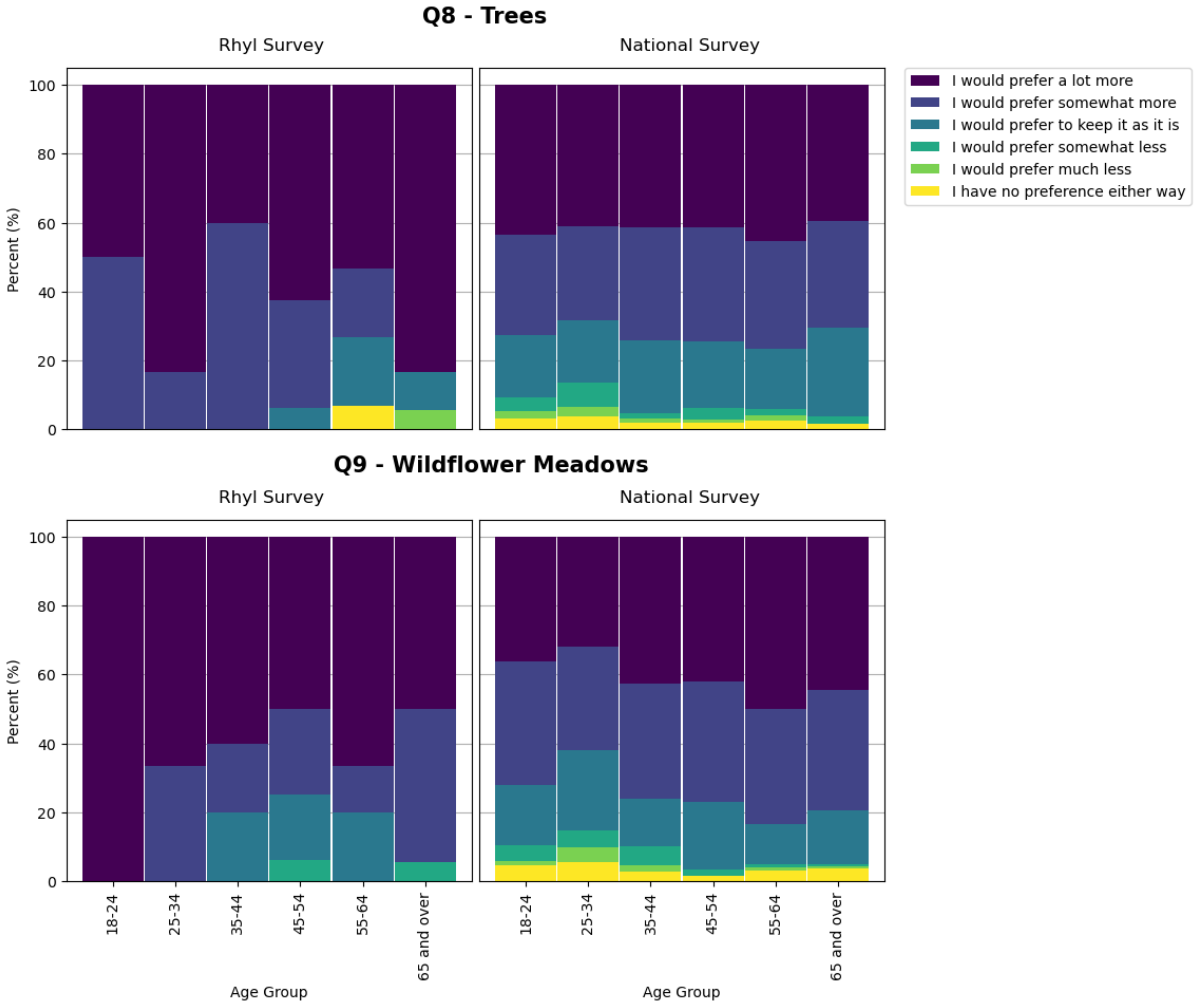


Figure 6. Q8 and Q9 by age group

Figure 6 illustrates the preferences for trees and wildflower meadows by age group. In the national survey, a Chi-Square test of independence was performed to test whether the variables (i.e., age group versus Q8 or age group versus Q9) were related. The test indicates that both Q8 and Q9 are significantly related to age group, and the most significant relationship is for wildflower meadows (trees: $p < 0.01$, wildflower meadows: $p < 0.001$). For wildflower meadows it appears that there is an increase in the preference for more wildflower meadows with increasing age (Fig. 6).

For the Rhyl survey, the opposite relationship is apparent, particularly for wildflower meadows where younger age groups seem to have a higher preference than older age groups. However, the relationships between age groups and Q8 and Q9 must be considered carefully as the same Chi-Square tests were employed and age group was not found to be significantly related to either Q8 or Q9. This is likely due to the smaller sample size of the Rhyl survey and a notably uneven distribution of respondents across age groups, where nearly 80% of the respondents are aged 45 or above.

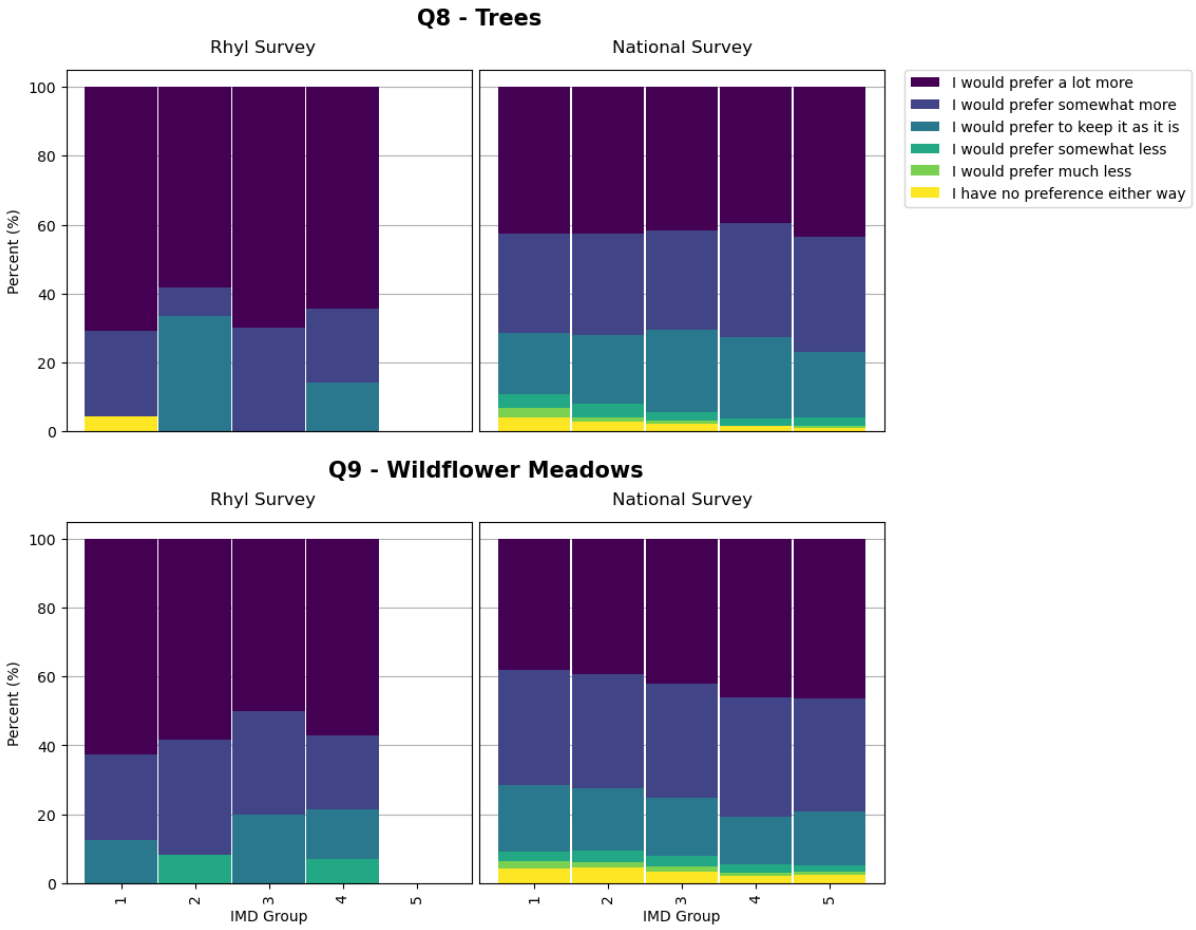


Figure 7. Q8 and Q9 by Index of Multiple Deprivation (IMD) groups

In Figure 7 the Index of Multiple Deprivation (IMD) is partitioned into deciles: 1 = most deprived and 10 = most affluent. Respondents are grouped into five groups based on postcode data. 1 = most deprived and 5 = most affluent. In the national survey both trees and wildflower meadow preferences increase as degree of affluence increases. However, Rhyl responses suggest a reversal of the national trend with the greatest proportion wanting more trees and wildflower meadows in the most deprived areas. This is particularly true for wildflower meadows: significant positive correlation between wildflower meadows and IMD in Q9 ($p < 0.01$). In Rhyl there is a general decrease in rates of those wanting more trees (less clear for wildflower meadows) in more affluent neighbourhoods. IMD decile group 1 (most deprived neighbourhoods) consistently has the highest proportion of wanting more trees, notably higher than the national average – whereas the more affluent neighbourhoods are typically closer to the national average. For wildflower meadows IMD decile group 1 again has a notably higher rate of support.

4.2.2 Tree and wildflower meadow placement preferences

Questions 10 and 11 asked respondents to select their preferences for tree or wildflower meadow placement across different areas within their neighbourhood.

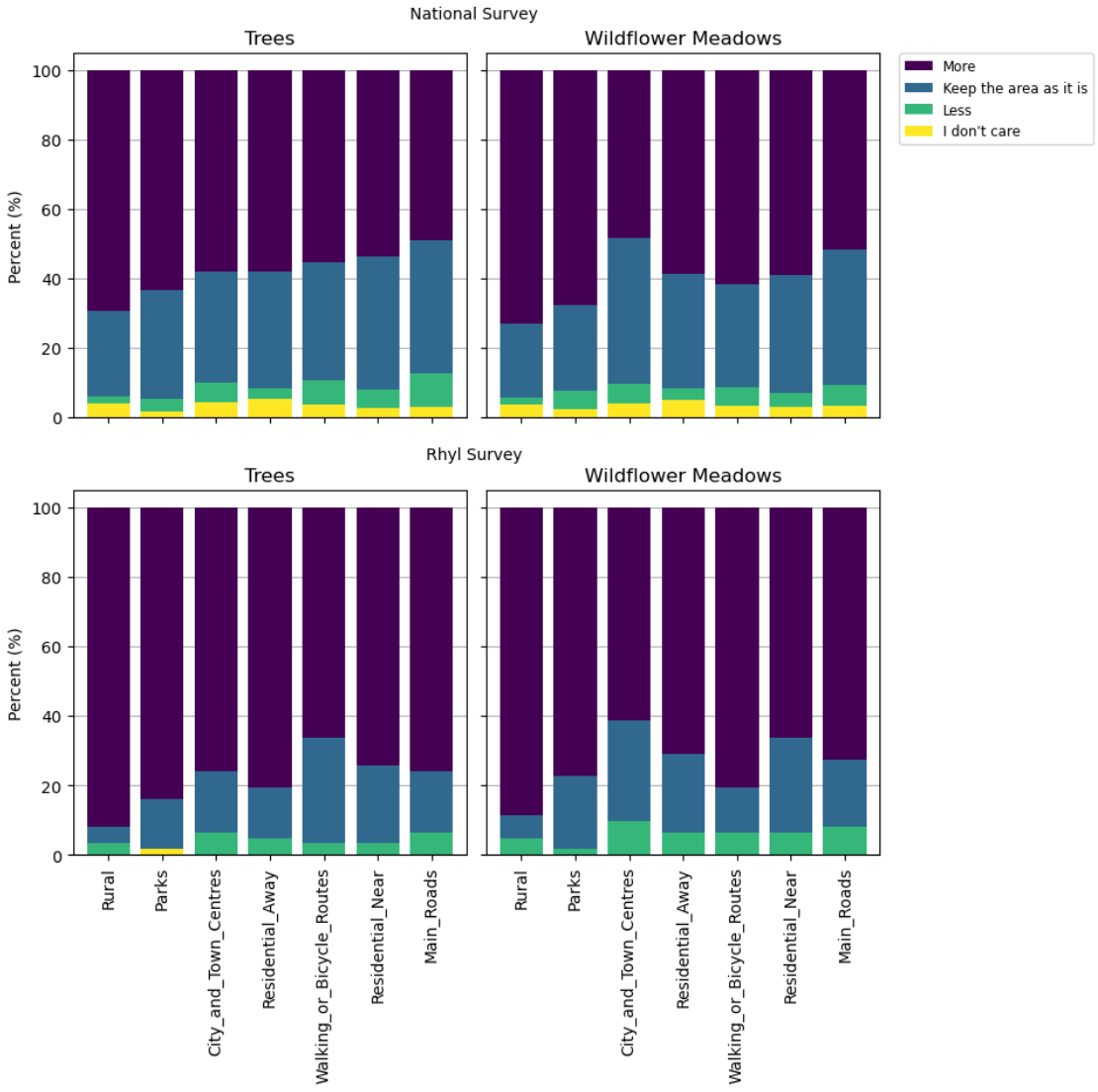


Figure 8. Q10 and Q11, location preferences for trees and wildflower meadows

The graphs in Figure 8 show that for both the national and Rhyl surveys, trees were rated best in ‘rural’ and ‘park’, but there are differences in the less highly rated areas. For the national survey these include ‘near residential areas’ and ‘main roads’. For Rhyl, the least highly rated is ‘walking or bicycle routes’ but it is still higher than the national survey (although not statistically significant). There is more of a difference in the wildflower meadow results. In the national survey ‘rural’ and ‘park’ are, like the trees, the best rated, with lowest rated being ‘city and town centres’. For Rhyl, wildflower meadows are rated highest for ‘rural’ and ‘walking or bicycle routes’ and lowest includes ‘city and town centres’ and ‘near residential areas’.

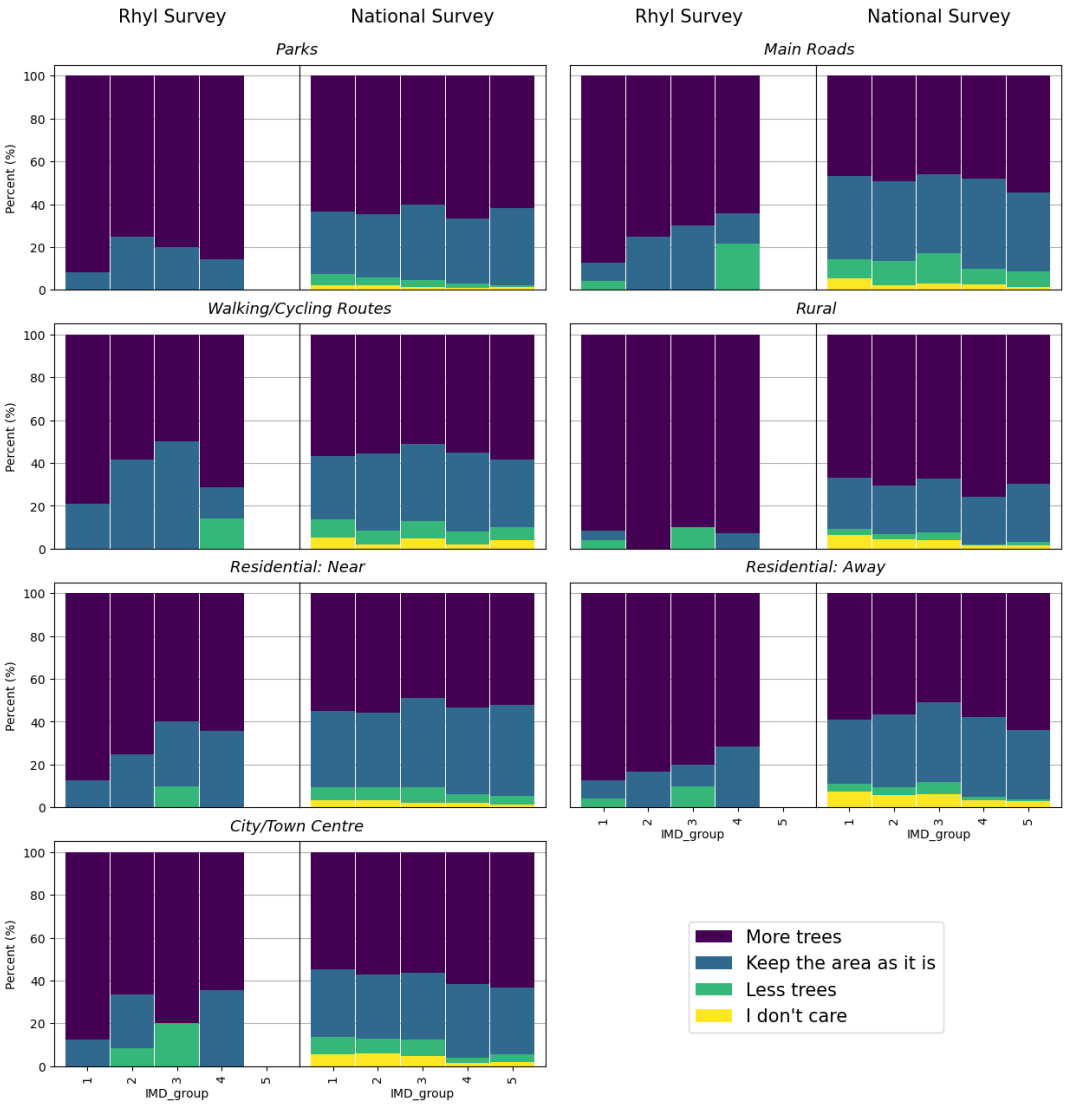


Figure 9. Q10: location preferences by IMD groups (trees)

Figure 9 of Q10 shows preferences for tree planting at each location, disaggregated by IMD group. Overall, the proportion of respondents in each IMD group wanting more trees in Rhyl is higher than the national average. In the national survey, there does not appear to be any strong relationship between IMD group and preference for trees at any specific location. The only location which is significantly correlated with IMD group in the national survey is for city/town centres, where more affluent areas have a higher proportion of respondents wanting more trees ($r = 0.07$, $p < 0.01$).

Contrastingly, Figure 9 shows more notable differences in preferences for trees at specific locations related to IMD groups in Rhyl. At nearly every location, IMD group 1, the two most deprived deciles, have the highest proportion of respondents wanting more trees. Despite a more notable relationship, only preferences for trees near residential homes are significantly correlated in Rhyl ($r = -0.27$, $p < 0.05$), where more deprived areas have higher proportions of respondents wanting more trees near residential homes. Considering tree preferences, of those that scored highest in Fig. 8 (‘parks’ and ‘rural’), 100% in IMD group 2 wanted more trees in rural areas. Of the least highly rated places in Fig. 8, 50% of IMD group 3 wanted more trees near walking and cycling routes.

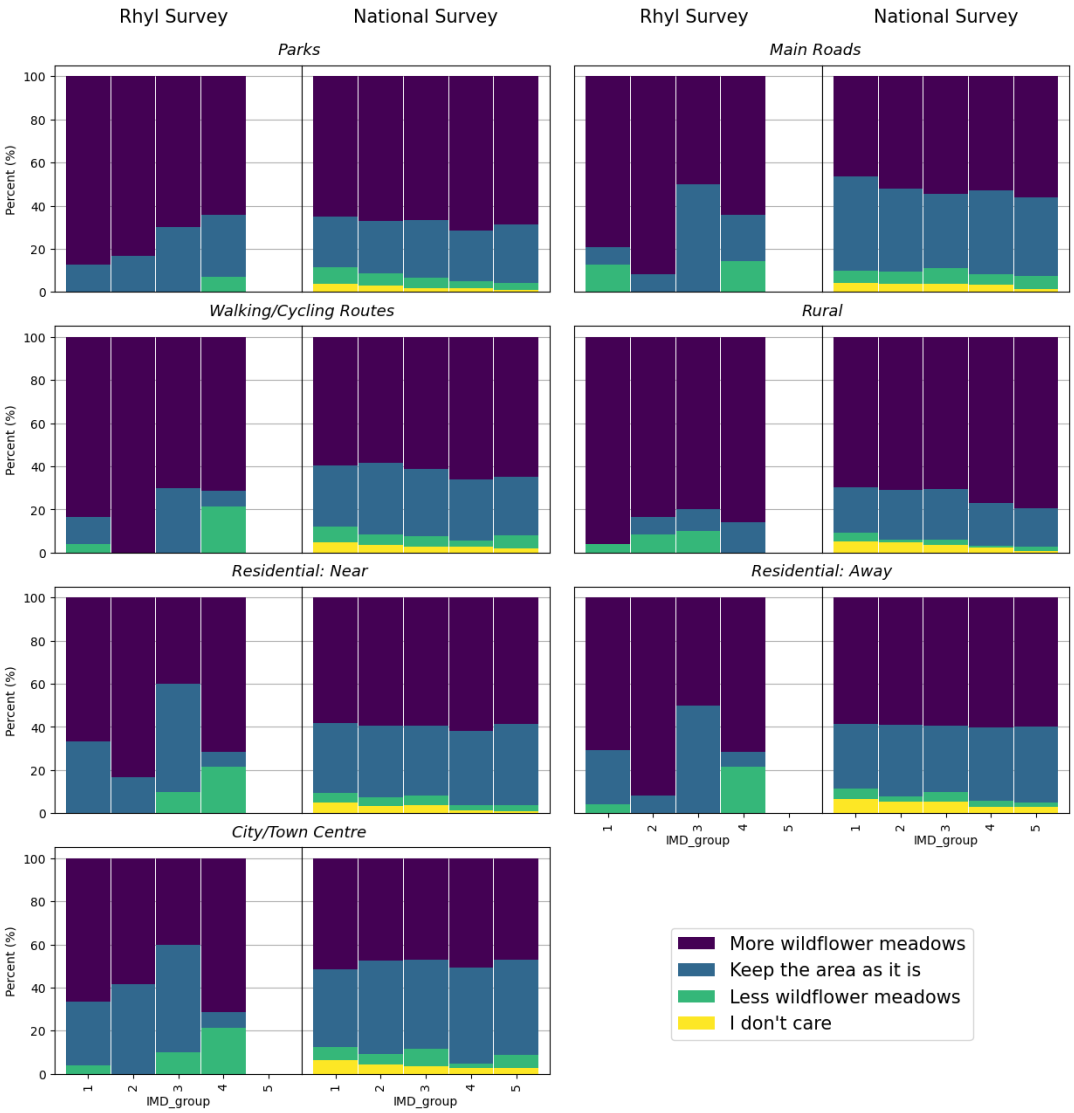


Figure 10. Q11: location preferences by IMD groups (wildflower meadows)

Figure 10 shows that there is somewhat more support for wildflower meadows in Rhyl than the national survey. Significantly, there is a general trend that there is higher support for wildflower meadows in more deprived IMD deciles: a statistically significant negative correlation for ‘parks’ ($p < 0.05$). The best locations for wildflower meadows were ‘walking and bicycle routes’ and ‘rural’ (Fig. 8). For the lowest ranked, 40% of IMD group 3 wanted more wildflower meadows ‘near residential areas’ or in ‘city and town centres’.

4.2.3 Benefits and Disadvantages of planting trees and establishing wildflower meadows

Q12 and Q13 of the online survey asked respondents to consider any benefits and disadvantages of new trees or wildflower meadows. These questions were open, free-text responses. We analysed these responses through text-based searches based on search term frequency. We did this by first analysing the Rhyl survey responses as there was a manageable dataset to manually search. We identified keywords from each respondent and then organised these into themes or groups (e.g., ‘pretty’ and ‘looks better’ as components of a wider ‘aesthetics’ group). Next, we ran searches on the national survey first using the keywords identified in the Rhyl

survey, as well as later use of additional synonyms (e.g., 'scenery' which was not found in the Rhyl survey but appeared as an aesthetic benefit by national respondents) and checking for typographical errors (e.g., 'wild life'). All the keywords used for our searches are listed in Table 6.

Table 6. Free-text responses about the benefits and disadvantages of their local council planting new trees (with/without benefits information and average)

Trees benefits/ disadvantages	%			%		
	Rhyl with	Rhyl without	Rhyl average	National with	National without	National average
Aesthetics. *Search terms: aesthetic; pretty; prettier; look/s good/better/nice; look at; improve the area; beauty; beautiful; lovely; scenery.*	42	26	34	11	14	12.5
Environment. *Search terms: environment; earth; planet; ecology; ecological; atmosphere.*	29	6	17.5	20	19	19.5
Health & Wellbeing. *Search terms: health/y; wellbeing; well-being; happy; happiness; feel better/positive/good; stress; mood.*	10	13	11.5	8	9	8.5
Wildlife. *Search terms: wildlife; wild life; habitat; bird; bees; insect; animal; biodiversity; nature.*	26	26	26	25	28	26.5
Air benefits. *Search terms: air; oxygen; pollution; O2.*	19	19	19	23	30	26.5
Flood protection. *Search terms: flood.*	0	10	5	1.5	1.5	1.5
Cooling. *Search terms: cool; shade.*	16	13	14.5	4	4	4
Disadvantages. *Search terms: maintenance; maintain; cost; tax; manage; expense; expensive; upkeep; danger; roots; leaves.*	13	26	19.5	16	20	18

Table 6 shows the most frequent benefits and disadvantages of trees cited by both national and Rhyl respondents. The columns represent data from the four versions of the survey: 2 Rhyl (with/ without benefits) and 2 national (with/ without benefits) and the average results for both Rhyl and national sample. It reports results as percentage of responses that contained the search terms. Individual responses that contained more than one of the search terms was not double counted as the filtered data was manually read and columns counted to verify. As the question was broad and

asked respondents to consider benefits and disadvantages of tree planting, some participants listed multiple benefits or disadvantages, or chose to write both benefits and disadvantages. It shows that wildlife benefits were important to around a quarter of all respondents and that on average, under a quarter of respondents cited disadvantages. The disadvantages search term list was created by firstly capturing all disadvantages noted in the Rhyl sample of 60 and then expanded to include synonyms. For the significantly larger national survey additional searches were conducted. This was firstly done by searching 'disadvantage' to see the reasons (e.g., 'driving visibility' and 'too many insects' were not raised by the Rhyl survey respondents) and then manually reading through the column to check for any missed keywords. This ensured that the term list covered the vast majority of responses. Air benefits were cited more frequently in the national survey, whereas aesthetics benefits were most frequent for Rhyl.

Table 7. Free-text responses about the benefits and disadvantages of their local council establishing new wildflower meadows (with/without benefits information and average)

Wildflower Meadows benefits/ disadvantages	%			%		
	Rhyl with	Rhyl without	Rhyl average	National with	National without	Cint average
Aesthetics. *Search terms: aesthetic; pretty; prettier; look/s good/better/nice; look at; improve the area; beauty; beautiful; lovely; scenery.*	23	13	16.5	10	17	13.5
Environment. *Search terms: environment; earth; planet; ecology; ecological; atmosphere.*	13	10	11.5	12	7	9.5
Health & Wellbeing. *Search terms: health/y; wellbeing; well-being; happy; happiness; feel better/positive/good; stress; mood.*	3	0	1.5	4	4	2
Wildlife. *Search terms: wildlife; wild life; habitat; bird; bees; insect; butterfly; butterflies; animal; biodiversity; nature.*	65	58	61.5	29	52	40.5
Air benefits. *Search terms: air; oxygen; pollution; O2.*	0	3	1.5	10	3	6.5
Recreation. *Search terms: recreation, walks, day out*	3	3	3	1	1	1
Disadvantages. *Search terms: mess; messy; ugly; untidy; unsightly; untended; hay fever, hayfever; allergies; unkempt; not good; not ideal, not looked after; maintenance; maintain; cost; tax; manage; expense; expensive; upkeep; weed/s; too many insects; driving; visibility.*	23	20	21.5	13	14	13.5

Table 7 shows the most frequent benefits and disadvantages of wildflower meadows cited by both national and Rhyl respondents. The columns represent data from the four versions of the survey: two Rhyl (with/ without benefits) and two national (with/ without benefits) and the average results for both Rhyl and national sample. It reports results as percentage of responses. It shows that wildlife benefits are most frequently cited across responses – and higher than in Q12 about trees – and aesthetics benefits as second highest response. The Rhyl survey returned a higher response rate for disadvantages that the national survey.

4.2.4 Relation between trees and wildflower meadows and climate change

The final survey question asked respondents whether they saw a relation between trees and wildflower meadows and climate change, and if so in what ways. This analysis was conducted by firstly filtering 'yes', 'no' and also the sum of 'yes & other'. To verify the responses the column was also checked by sorting alphabetically to read through the responses. This enabled us to account for additional negative or neutral responses (e.g., 'unsure' or 'there is none') as well as positive responses that did not include the word yes (e.g., 'of course' or 'there is'). Table 8 shows the responses in percentage form across the surveys. 'Yes' denotes those responses that only said yes (or 'yeah' and 'I do'). 'No' includes those that wrote 'no' (or 'not really', 'I do not' and those who chose 'N/A') including any given rationale. 'I don't know' includes those who responded that they were 'unsure;. All other responses were free-text responses that neither said 'yes', 'no', nor 'I don't know'. These responses were content checked and negative responses categorised accordingly (e.g., "I haven't seen any relation in my neighbourhood" moved to 'no'; "can't think of anything" categorised as 'I don't know').

Table 8. Responses to Q14.

Response	%					
	Rhyl with	Rhyl without	**Rhyl average**	National with	National without	**National average**
Yes	30	30	**30**	15	18	**16.5**
No	7	17	**12**	24	25	**24.5**
I don't know	3	10	**6.5**	11	8	**9.5**
Other response	60	43	**51.5**	50	50	**50**
Positive response (responses that **do** see a relation)	90	73	**81.5**	65	68	**66.5**

Table 9. Text searches of those who responded that they did see a connection (including 'yes' responses and 'other')

Response	**%**					
	Rhyl with	Rhyl without	**Rhyl average**	National with	National without	**National Average**
Air. *search terms: air; oxygen; pollution.*	22	27	**24.5**	25	24	**24.5**
Carbon. *search terms: Carbon; CO2*	11	18	**14.5**	20	27	**23.5**
Loss. *search terms: loss; less; lose; losing; reduction; decline; destroy; cut; chop; fewer.*	26	23	**24.5**	15	15	**15**
Help. *search terms: help; aid*	4	14	**9**	22	24	**23**
Environment. *search terms: environment.*	15	0	**7.5**	8	10	**9**
Bees. *search terms: bees.*	11	5	**8**	5	4	**4.5**
Prevent. *search terms: prevent.*	4	9	**6.5**	1	1	**1**

Table 8 shows that Rhyl respondents respond more positively than in the national survey, with higher 'yes' responses and fewer 'no/ I do not' responses. Table 9 offers additional analysis of this data through text-based searches of thematic frequency. It shows that around a quarter of all respondents see the connection between trees/wildflower meadows and climate change as regards air. Almost a quarter of national respondents also see the connection as regards carbon, whereas the Rhyl average is under fifteen per cent. Almost a quarter of Rhyl respondents write about loss which is higher than the national survey, and Rhyl respondents also mention prevention more frequently than the national respondents.

5. Interview Results.

5.1 Interview Part 1. Woodland creation and Wildflower meadow establishment

Interviewees were asked, in Part 1, whether they noticed trees/wildflower meadows in their local area, whether there were too many or too few trees/wildflower meadows, the importance of trees/wildflower meadows, about influence over site management, and benefits and disadvantages of tree planting or establishing wildflower meadows. Interviewees were asked ten structured questions about trees, and then asked the same questions about wildflower meadows. Of the 28 interviewees, 93% responded that they noticed trees in their local area. 96% said that trees mattered to them and 82% reported feelings of connection to trees. For wildflower meadows, 68% responded that they noticed them in their local area; 96% stated that wildflower meadows mattered to them and 75% reported feelings of connection. 82% of interviewees stated it was important to spend time among trees, 68% said it was important to spend time among wildflower meadows.

Management and maintenance were important to interviewees:

- 82% said that tree management and maintenance was ‘very important’ or somewhat important’.
- 60% said that they would like more say or to be involved in tree management and maintenance.
- 79% said that wildflower meadow management and maintenance was ‘very important’ or somewhat important’.
- 82% said that they would like more say or to be involved in wildflower meadow site management and maintenance.

5.1.1 Overall results of support and against Denbighshire County Council’s GI scheme

<u>Support for trees.</u>

Question 7 in Part I of the interview asked participants whether they thought more trees in their neighbourhood would be of value. They were asked whether they thought it would be good or not good for them personally, and good or not good for the community. The responses are as follows:

Agree it is good personally = 75% (21). Agree it is good for the community = 82% (23).

Neutral whether it is good or not personally = 17% (5). Neutral whether it is good or not for the community = 10% (3).

Disagree it is good personally = 7% (2). Disagree it is good for the community = 7% (2).

Table 10 provides more information about the most frequently cited reasons for their support of planting new trees or reasons against trees.

Table 10. Rationale for support or against trees

Reasons for support of trees		Reasons against trees	
Wellbeing	46% (13)	Encourage vandalism or site for antisocial behaviour	14% (4)
Wildlife	42% (12)		
Air quality	32% (9)	Damage or potential damage to property	7% (2)
Environment	25% (7)		
Aesthetics	25% (7)	Uproot pavements	3% (1)
Educational/ for children	25% (7)		
Flood protection	7% (2)		
Noise reduction	3% (1)		

Support for wildflower meadows

The next section similarly asked participants whether they thought more wildflower meadows in their neighbourhood would be of value. They were asked whether they thought it would be good or not good for them personally, and good or not good for the community. The responses are as follows:

Agree it is good personally = 78% (22). Agree it is good for the community = 82% (23).

Neutral whether it is good or not personally = 10% (3). Neutral whether it is good or not for the community = 10% (3).

Disagree it is good personally = 10% (3). Disagree it is good for the community = 7% (2).

Table 11 provides more information about the most frequently cited reasons for their support of establishing wildflower meadows or reasons against wildflower meadows.

Table 11. Rationale for support or against wildflower meadows

Reasons for support of wildflower meadows		Reasons against wildflower meadows	
Wildlife	50% (14)	Aesthetics	14% (4)
Wellbeing	46% (13)	Losing space for people or houses	10% (3)
Biodiversity	42% (12)		
Environment	17% (5)	Impact on dog owners	7% (2)
Aesthetics	17% (5)	Allergies	7% (2)
Connection to nature	10% (3)	Vandalism	7% (2)
Educational/ for children	10% (3)	Insect stings	3% (1)
Flood protection	3% (1)		

5.2 Interview Part 2. Associated benefits of tree planting or establishing wildflower meadows

In this part of the interview, the 28 interviewees were presented with a series of benefits associated with trees or wildflower meadows and they were asked how important each benefit was to them personally and whether they felt that trees or wildflowers contributed to each benefit. Interviewees were asked to rank each benefit's importance according to a 5-point Likert Scale and then the contribution of trees/wildflower meadows towards these benefits according to a 5-point Likert Scale.

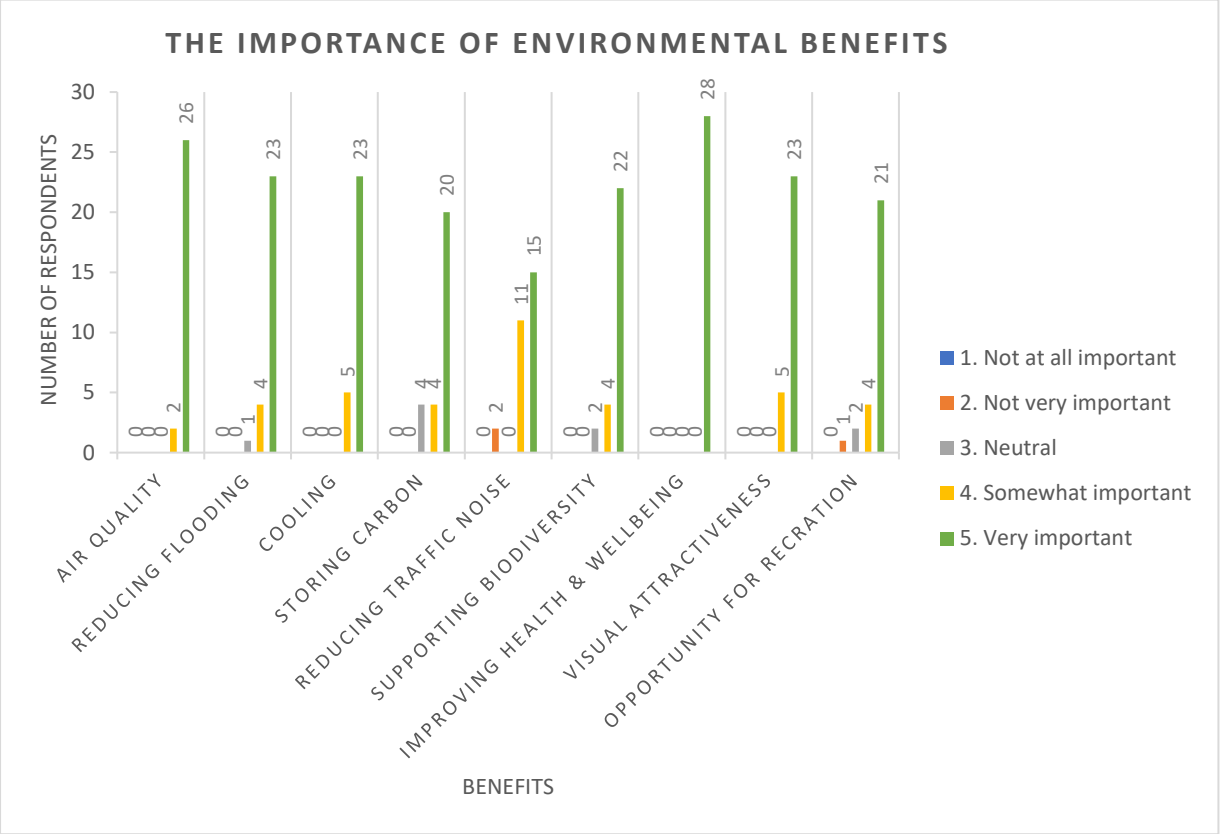


Figure 11. Distribution of individuals' responses to their sense of personal importance of each environmental benefit associated with tree planting and establishing wildflower meadows.

The results in Figure 11 show that each benefit is important to most respondents. Improving health and wellbeing was 'very important' to 100% of those interviewed and air quality was 'very important' to 93% of respondents. The lowest scoring benefit was reducing traffic noise in which 54% selected that it was 'very important' and two participants (7%) stated that it was 'not very important'. Only one other benefit, opportunity for recreation, returned a negative response with one participant (3.5%) selecting that it was 'not very important'. No benefit was deemed as 'not at all important' by any respondent.

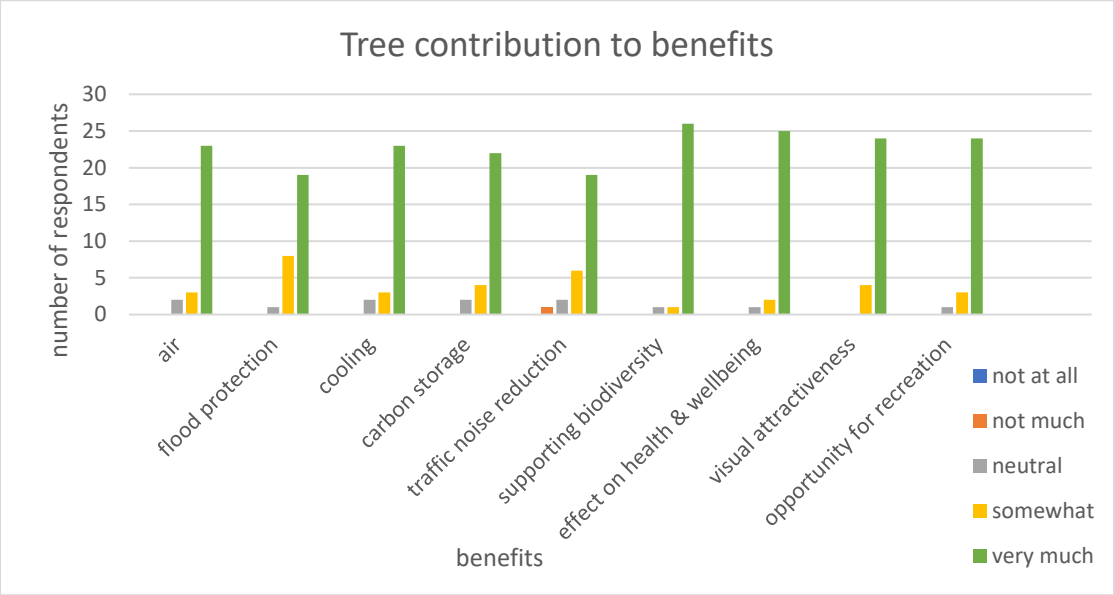


Figure 12. Distribution of interview responses to how much people think that trees contribute to each of the associated benefits.

Figures 12 and 13 reveal the different perceptions of tree and wildflower meadow benefits. The majority of respondents thought that trees contributed 'very much' to each benefit (Fig. 12). Figure 12 shows that 100% of respondents said that trees help to improve the visual attractiveness of the area. Only traffic noise reduction received a negative response, with one interviewee (3.5%) selecting 'not much' (Fig. 12).

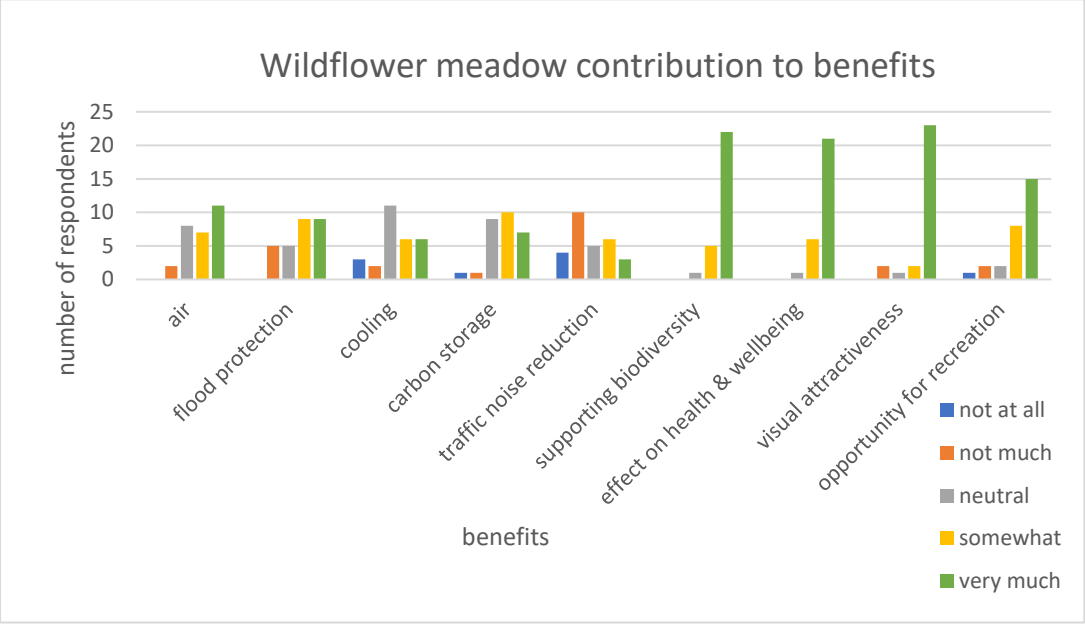


Figure 13. Distribution of interview responses to how much people think that wildflower meadows contribute to each of the associated benefits.

The results for wildflower meadows differ from those for trees. The majority of respondents said that wildflower meadows contributed 'very much' to the benefits of supporting biodiversity, effect

on health and wellbeing, and visual attractiveness (Fig. 13). Figure 13 shows that 64% and 61% of respondents thought that wildflower meadows contributed 'somewhat' or 'very much' to air quality and carbon storage, respectively. While 64% agreed that wildflower meadows contributed positively to help with reducing flooding, 18% said that wildflower meadows contributed 'not much' to flood protection. 7% of respondents also said that wildflower meadows contributed 'not much' to cleaning the air, cooling, visual attractiveness of the area, and opportunities for recreation. Three participants (11%) said that wildflower meadows contributed 'not at all' to cooling, with 3.5% selecting 'not at all' to carbon storage and opportunities for recreation.

5.3 Interview Part 3. Community perceptions of Denbighshire County Council's GI Scheme

The last part of the interviews asked participants questions relating to the Council's tree planting and wildflower meadow scheme; including why the scheme was initiated, community engagement in the project, information dissemination, and participants' views on six sites – four wildflower meadows (two new, two established) and two woodlands (one new, one established). The first question asked interviewees why they thought Denbighshire County Council are planting trees and establishing wildflower meadows. The most cited reasons are in Table 12 (multiple responses were possible):

Table 12. Why participants think Denbighshire County Council are creating woodlands and establishing new wildflower meadows, and the number of responses for the reasons.

Reason	**Participant responses % and number of individual responses**
For the environment	21% (6)
To benefit residents	17% (5)
Financial reasons	25% (7)
Central/Welsh Government initiative	14% (4)
Climate change	17% (5)
Because it is what the people want	3% (1)
Benefit the area	11% (3)

These results show that the most frequently cited reasons are positive, with twenty responses surrounding climate change mitigation and benefits to the environment and benefits to the Rhyl community. Of negative or sceptical responses, a quarter of participants stated that they thought it was a cost-cutting exercise and four participants stated that the Council were obliged to do so under government direction.

Each interviewee was shown six sites, in the following order: 1 Coronation Gardens (new woodland); 2 Olivia Drive (new wildflower meadow); 3 Holly Close (new wildflower meadow); 4

Hilton Drive (existing wildflower meadow); 5 Rugby Club Walkway (existing wildflower meadow); 6 Maes Gwilym (existing woodland). They received printed copies of Denbighshire County Council's site plan images as well as photographs of the sites taken by the researcher in April 2023. To help visualise the sites participants were also shown a map of where each site is located in Rhyl, using Google Maps online. Participants were asked to rate the six sites scored on a five-point Likert scale; 1 = strongly dislike; 2 = somewhat dislike; 3 = neutral; 4 = somewhat like; 5 = strongly like.

Table 13. Site preferences

Site	**Strongly like %**	**Somewhat like %**	**Neutral %**	**Somewhat dislike %**	**Strongly dislike %**
Maes Gwilym	86	11	0	0	3
Rugby Club Walkway	54	29	14	3	0
Hilton Drive	64	21	11	0	3
Holly Close	50	36	11	0	3
Olivia Drive	57	25	7	7	3
Coronation Gardens	61	21	7	3	7

Table 13 shows that each site was strongly liked by half or more interviewees and each site received over 80% positive responses. Maes Gwilym woodland was the most liked of the six sites with 97% of respondents selecting 'somewhat like' or 'strongly like'. The most disliked sites were Olivia Drive and Coronation Gardens with 10% of respondents selecting 'somewhat dislike' or 'strongly dislike'.

Positive reasons given:

- I love seeing more nature.
- I've always been interested in the environment.
- It is so important when thinking about the social deprivation in Rhyl and not all children have access to gardens.
- I like that they're near where people live and you don't need to travel to see them.
- You can't have too much of these things.

Negative reasons given:

- Coronation Gardens needs more planting; trees in rows look unnatural.
- Patches of wildflower meadows is just cosmetic and more nature corridors needed.
- More flower seeds are needed as the long grass looks scruffy and uncared for.
- Trees too close to people's houses.
- Residents have not been given the right information about what the Council are doing.
- Lack of diversity.
- Don't like it near residential areas.

In addition to scoring the sites participants were asked how often they visited these places. 46% said they regularly visited versus 20% who said they did not visit, or only drove past.

5.3.1 Community Engagement

The remaining interview questions were about community engagement and perceptions of inclusion. Participants were asked whether they thought the community was engaged in the project. 10% responded that yes, they thought the community was engaged and a further 21% stated they thought some parts of the community, but not everyone, was engaged. 35% did not think the community was engaged and 32% responded that they did not know. Additionally on inclusion, 92% said they did not feel included in the scheme. 85% said they would like to be included more. When asked about what they would like seen done differently as regards Denbighshire County Council's scheme, engagement was the most frequently cited change, with 35% of respondents stating they would like to see the community engaged more. Other responses included to plant more flowers (10%) and species consultation (7%), different site locations (14%) and scheme expansion (7%), with one participant (3%) requesting more inclusivity. Participants demonstrated interest in the scheme. When asked about receiving information about the Council's plans, 57% wanted a high level of detailed information and 35% selected medium level of detailed information. Only one person selected low level information and another one person did not want any information. 89% of participants would like to get involved in tree or wildflower meadow activities but only 35% stated they would know who or where to contact to take part.

6. Intermediate summary

The survey and interview results answer our research questions. To take the second question first – whether provision of specific information about co-benefits change perceptions and engagement – we found no significant difference in survey responses for questions 8 to 11 between those who received additional information before answering the questions, and those who did not. However, we did see that the Rhyl responses show more differentiation in questions 12 and 13 (Table 6 and Table 7). Table 6 shows the most frequently cited associated benefits and disadvantages of trees cited by both national and Rhyl respondents. Table 7 shows the most frequently cited associated benefits and disadvantages of wildflower meadows cited by both national and Rhyl respondents. The Rhyl responses show more differentiation between those with and without benefits which suggests they picked up the benefits in their responses. This points at the possibility that they read the information more closely than the national participants, due to their engagement with the subject. Rhyl participants rated personal interest in environment matters more highly than the national sample (Fig. 2 and Fig. 3), which supports the suggestion of the Rhyl survey respondents' higher engagement with the subject.

In accordance with our overall survey results, receiving additional information did not have a significant effect on interview responses. Two interview participants commented on the additional information received: one participant did not like to consider trees or wildflower meadows from an economic perspective but strongly supported more trees and more wildflower meadows across all locations, the other mentioned that they hadn't previously considered such wider benefits but continued to indicate preference for somewhat more trees and wildflower meadows depending on location. In the focus group one participant was very much aware of biodiversity benefits and supported tree planting and wildflower meadow creation but still strongly disapproved of the establishment of a wildflower meadow near their residential area. The interviews corroborate the survey results in that providing benefits information does not change perceptions and engagement; despite discussion about the benefits of trees and wildflower meadows, those that did not like them continued to dislike them, and those who already supported them continued their support.

Connected to this are our other research questions: whether the type of GI affects its acceptability, and to what extent perceptions of residents in Rhyl reflect perceptions across the UK. A key finding from the surveys is that there is generally overwhelming support for trees and wildflower meadows both nationally and in Rhyl. This is a significant result as our hypothesis and literature survey indicated that people can be hesitant to change. In the national survey 73% responded that they wanted more trees in their neighbourhood and 75% wanted more wildflower meadows. The Rhyl survey recorded higher ratings with 87% wanting more trees and 85% wanting more wildflower meadows. This could be because of the ways in which participants self-selected, or it could be that certain features of Rhyl do not reflect national patterns. In the online survey, Rhyl residents cited aesthetics benefits and cooling benefits of trees more highly than the national

average, which reflects that people from a town with little urban tree coverage (such as Rhyl) notice the lack of greenspace.

6.1 Index of Deprivation

An interesting result from the survey is that there is more support in Rhyl from the groups of the lowers IMD deciles: IMD decile group 1 (most deprived neighbourhoods) consistently had the highest proportion of wanting more trees and wildflower meadows and it is only the more affluent areas that are typically closer to the national average. Interview data corroborates the Rhyl survey results. Rhyl's most deprived areas are mainly concentrated in the West wards: Rhyl West 1 and Rhyl West 2 are the most deprived Lower Super Output Areas (LSOA) in Wales (ranked 1 and 2 out of 1909 overall). This contrasts with some of the eastern or southern Rhyl LSOAs that are among the 50% least deprived in Wales. While the national survey indicated that those in more affluent areas wanted more trees and wildflower meadows, this trend was reversed in Rhyl, with those from most deprived postcodes wanting more GI schemes. In our interview sample postcode look up was available for 24 of 28 interviewees.[2] The breakdown is shown in Table 14.

Table 14. Number of interviewees across WIMD deciles

Welsh Index of Multiple Deprivation decile	Number of Interviewees
10% most deprived	8
11% - 20% most deprived	3
31% - 50%	4
50% least deprived	9

Table 15 shows the number of respondents within this sample those who said it was 'extremely important' or 'important' to spend time among trees:

Table 15. Number of respondents agreeing with the importance of spending time among trees, across WIMD deciles

Welsh Index of Multiple Deprivation decile	Number of Interviewees
10% most deprived	8 (100%)
11% - 20% most deprived	1 (33%)
31% - 50%	4 (100%)
50% least deprived	6 (66%)

The remained (5 participants) all stated that it was neither important nor unimportant to them.

Table 16 shows the number of respondents within this sample those who said it was 'extremely important' or 'important' to spend time among wildflower meadows:

[2] Two participants did not complete the online form which captured postcode; one chose not to supply this optional information; one did not offer a valid postcode which could be used in the WIMD tool.

Table 16. Number of respondents agreeing with the importance of spending time among wildflower meadows, across WIMD deciles

Welsh Index of Multiple Deprivation decile	Number of Interviewees
10% most deprived	8 (100%)
11% - 20% most deprived	1 (33%)
31% - 50%	4 (100%)
50% least deprived	5 (55%)

5 participants stated that it was neither important nor unimportant to them. 1 participant (50% least deprived) selected that they avoided wildflower meadows as much as they could.

Some of the narrative that surrounds this data includes that interview participants noted the difference in greenery between the west and east of Rhyl. Participant 9 stated that "there aren't enough trees in the town itself" (West Rhyl) but that in the direction of the east that the "estates are bigger and they have more garden and quite a lot of them have trees". Several participants pointed to the bedsits and flats that were the housing types around the town centre (West Rhyl) and that people who lived there had no access to trees or wildflower meadows. These participants supported the planting of more trees and wildflower meadows so that people could access greenery that they cannot have within their own homes. One participant referenced that those who live in bedsits or flats may not have money for recreation and that access to trees or wildflower meadows could provide an area for "people with depression to go for a walk" or that parents could "take the child to a meadow to look at the flowers and show them things" (Participant 22). Another participant similarly said:

> "For me, I think people in flats, they obviously don't have gardens. It's nice for them to get out and see a bit of flower and sit and read their books. There's quite a lot of people do that, you know" (Participant 8).

During interview one participant stated that as they lived in a flat in West Rhyl (Rhyl West 2) they do not see much nature. They stated that more woodland would be of value because they experienced "just seagulls visiting my window" and added "it would benefit on so many levels: spiritually, mentally, physically and emotionally" (Participant 12). The participant also wanted to see more wildflower meadows nearby where they lived, stating that they would "bring more colour to life" and "benefit us emotionally". Participant 26 also lived in West Rhyl. They strongly supported tree planting and establishing wildflower meadows. They said they wanted to see more trees in the town centre but noted that Denbighshire County Council's new GI schemes were mainly concentrated in East Rhyl. When they were asked to rate the six sites identified for interview, they replied:

> "It's good that they're doing something so I don't want to be negative giving a low score because it's good that they're doing it no question. But I mean, it's kind of just cosmetic, isn't it? Just a little patch here and a little patch there? While, at the same time, in the centre and in West Rhyl, they seem to be concreting everything over. And they're not really, you know, just doing these things and compensating for what they're destroying. And also none of

those are in West Rhyl all are in the East. So consequently, I don't really get to go there or have no reason to, and so I'm not benefiting from those" (Participant 26).

This statement supports what other participants said during interview in that they noticed more trees in the east of Rhyl, especially in the residential areas, and noticed an absence of trees in the west of Rhyl, in particular the town centre area.

6.2 Place preferences for trees

The Rhyl survey identified that the best places for trees were parks or rural areas, and the lowest rated were walking and bicycle routes. Despite parks and rural areas preferred at survey, during interview participants responded somewhat differently. At interview, they were asked where they would plant new trees in the local area, with a follow up question of whether they thought there was any area in Rhyl that had too many trees. The responses:

- 25% (7) of respondents stated along the promenade.
- 25% (7) of respondents stated in the town centre and along main roads.
- 96% (27) of respondents said that they did not believe there was any place in Rhyl that had too many trees. 3.5% (1) respondent stated there were too many trees in the town centre and near residential areas. The focus group all also liked trees and supported the planting of new trees in Rhyl.

During the interview participants were invited to respond to the question about any disadvantages of planting new trees in Rhyl. Responses to this question corroborate the lower rating seen in the survey for trees along walking or cycle routes. Participant 25 mentioned personal safety, stating that when it is darker or during winter they would avoid wooded areas "from a safety perspective" and would choose to walk around the main roads. Participant 24 stated that more trees "would take away from pedestrian spaces I imagine" and added that "we can't make the roads or pavements narrower, so where are trees supposed to go?".

53% (15) of respondents said that they didn't think there were disadvantages to tree planting, but 25% (7) of respondents stated concern about the maintenance and management of trees as a possible or real disadvantage and 32% (9) of respondents added that there are no disadvantages providing they are planted in an appropriate place.

6.3 Place preferences for wildflower meadows

The Rhyl survey identified that the best places for wildflower meadows was 'rural' and 'walking or bicycle routes' and lowest rated were 'city and town centres' and 'near residential areas'. In interview there was a mixed result as regards placement for wildflower meadows with most respondents saying they'd like to see them anywhere possible. The responses to the question asking about their personal thoughts of where they would establish new wildflower meadows in Rhyl are as follows:

- 21% (6) of respondents said anywhere.

- 18% (5) of respondents stated along the promenade.
- 10% (3) of respondents said residential areas.
- Brickfield Pond, Marine Lake, Drift Park and Llys Brenig were all stated by 7% (2) of respondents.

89% (25) of respondents said that they did not believe there was any place in Rhyl that had too many wildflower meadows. 7% (2) said there were too many by the roadside and 3% (1) said there were too many near buildings. The focus group all said that they did not like the wildflower meadows by their residential area, which supports the Rhyl survey results which revealed the residential areas as one of the least preferred areas for meadows.[3] When the focus group were asked by the Researcher what changes could be made to gain their support, their unified reply was to restore the area to how it was before. This is again different to the interviews as during interview participants stated that in their experience, neighbours that do not support wildflower meadows near their residences would be more supportive if more flowers were sown and if the wildflower meadows had a good balance of long grasses and colourful flowers.

During interview participants were also asked to consider what disadvantages they would see in establishing new wildflower meadows in their local area. Responses to this question corroborate the lower rating seen in the survey for lowest rated places for wildflower meadows. Participant 27 stated that a disadvantage was “people’s perceptions that if they become unruly they might be unkept – which they might be, I don’t know”. Aesthetics was the most commonly cited disadvantage with 14% (4) of respondents saying they can look ugly or scruffy. 7% (2) of respondents were also concerned about allergies. 50% (14) of respondents did not think there would be disadvantages but 25% (7) of respondents stressed the need for appropriate maintenance and the costs this involves.

The focus group were wholly unsupportive of the wildflower meadow near their homes. Despite good awareness of biodiversity benefits more generally and they were not opposed to other interventions but they hated the new meadow by their bungalows, citing ugliness, that it could attract vermin, that the view out of their front room was now obscured by the Council’s wildflower meadow signage, and that it impeded walking routes: that the direct route to the bus stop was now inaccessible and that the elderly residents had a longer route to get there, which made things harder for them in the group’s opinion. They also disliked the new meadow on the main road entering Rhyl, stating that it gave the wrong impression to visitors to the area, of one that Rhyl is scruffy in contrast to the pretty flowers they see when visiting Rhuddlan or Prestatyn (there are flowers within the roundabouts there and along some verges). They mentioned other places had pretty poppies and other flowers, whereas the meadow under dispute was long grass and did not contain and wildflowers. One said that Rhyl already has a bad reputation, but that they used to live in what was known as the ‘posh part’, but now with the meadow they felt embarrassed

[3] Note that the focus group did not complete the online survey and their thoughts are not reflected in that data set.

of their area. This was a cause for concern as several houses in the area were up for sale, and they felt the untidiness of the neighbourhood as a result of the wildflower meadows could affect buyer interest. The only solution in their opinion was to get rid of the wildflower meadow and the local councillor supported this complaint to the Council. It is important to note that while these voices were loud and clear, they were a minority overall. Other interviewees also lived near new wildflower meadow sites (several by Holly Close) and they were overall supportive of the scheme, despite some stating that more colour or flowers would improve the site.

6.4 Engagement

Several participants noted that they would like to be more informed or engaged. During interview 35% of participants did not think the community was engaged and 85% said that they would like to be more included. Rhyl returned a higher response than the national survey for seeing a connection between trees and wildflower meadows and climate change, which links to the interviewees' readiness to engage with the planting scheme. Several liked the 'bee signs' (the signs that accompany some wildflower meadows sites to explain what they are) but noted that the sign is too small to read, that it doesn't offer enough information, and that some sites lack signage. A few participants discussed engagement in detail. They said that they'd like the Council to share more information, e.g., Participant 25 said that while they understood why Denbighshire County Council were establishing wildflower meadows, they'd like to hear more updates or a polite notice such as 'bear with us' when the sites look ugly with explanation that wildflower meadows take a long time to fully establish. Participant 25 stressed that many neighbours do not like the look of the local wildflower meadows by Holly Close but that if it had more flowers or an explanation that future work by the Council will improve it, then most residents would support it. Participant 7 and Participant 13 said they had sown flower seeds in some meadows in attempt to improve them. Participant 24 wanted a comments box or a way to share feedback or updates about the sites, or ways to easily contact the Council about trees or wildflower meadow matters. They were unaware of DCC's Biodiversity Team and thought that these GI schemes would be part of their local councillor's remit. None of the interviewees referred to DCC's Biodiversity Team but two participants knew the names of relevant Council staff to contact.

6.5 Themes

The key themes that recurred in the interviews were **mental health and wellbeing**, the **next generation**, and **bees and pollinators**. Across the 28 interviews every participant made the positive link between either trees or wildflower meadows (often both) and at least one of the three key themes identified. This connection was made during Part I of the interview ahead of Part II which drew attention to the associated benefits (including biodiversity, effect of health and wellbeing, and opportunities for recreation). This not only corroborates the result that receiving additional information before interview did not alter responses, but also that the key benefits identified and presented by the research team are already well-known by Rhyl residents, and they agree on their importance. The survey results highlight the theme of lament, with **loss** and **prevention** more frequently cited by Rhyl residents in their free-text responses to Q14 than the

national respondents. This reveals that the people of Rhyl are aware of the connection between lack of greenspace and climate impacts and supports the interview results that the majority do not think there are any places in Rhyl that have too many trees or wildflower meadows. These factors could be leverage in future communications about GI schemes of this kind.

7. Conclusions

This project quantified the benefits of GI schemes (in this case tree planting and establishing wildflower meadows) and provided an economic value of up to £3,669 for the associated benefits of trees and wildflower meadows based on Denbighshire-relevant data. The data from model results such as these are also useful for cities. For example, providing performance figures for one hectare of trees allows council officers to add up the multi-functional benefits and plan future greening in their location. Our social data revealed that people are ready for change and that it is a misconception that people are hesitant to adopt GI. We found that there is a higher overall preference rate for trees and wildflower meadows in Rhyl relative to the national sample. Survey respondents in Rhyl showed significantly greater positive perceptions about trees than the UK average, and there was a general trend of IMD connection reversed in Rhyl with those from the most IMD deciles wanting more GI schemes (whereas most support was from the affluent areas across the national survey). The Rhyl survey returned free-text responses surrounding loss and prevention much more than in the national survey, which suggests that Rhyl residents notice the lack of greenspaces locally, either as loss of historical greenspaces or want to prevent future loss of trees and land. The interviews supported this trend as participants cited deprivation in Rhyl and that trees and wildflowers in public places can provide residents with a range of benefits. It could be that certain features of Rhyl do not reflect national patterns, and there are other factors to explore including future research to compare Rhyl with similar socio-economic or environmental areas (e.g., coastal towns; places with poor tree coverage) across the UK.

We found in Rhyl that the vast majority of residents who engaged with our research not only supported GI schemes of this kind but also wanted to engage with the process, as 85% of interviewees said they would like to be included more. The interest in this topic was clear from the number of people who responded to the invitation to interview; many residents quickly volunteered to take part and several said that they did not want to accept the cash gift and that they would instead donate it to a charitable cause. Many of those interviewed were interested in the topic beyond our research, with 92% saying that they would like medium or high level of detailed information about Denbighshire County Council's GI schemes and 89% stating that they would like to get involved in the related activities. Co-creation of new sites between the Council and residents would therefore work well in future, as those who were interviewed offered suggestions as to possible future locations for new trees or wildflower meadows. Interviews and surveys showed that health and wellbeing benefits were most important and most frequently cited as regards trees, and care for pollinators most important in discussion of wildflower meadows. Some responses suggested that a description of 'biodiversity meadows' rather than 'wildflower meadows' might lead

to less disappointment with meadows seen as not full of flowers and/or ‘untidy’ in winter. Future engagement could tap into this community discourse as an indication of local support for new GI schemes of this kind.

Finally, it is important to note that most studies such as ours gather social data on location in parks, whereas we recruited a randomly stratified sample of residents to attend interview at an agreed time and date. Therefore, an additional benefit of our research is that we invited views from those who choose not to spend time in greenspace as well as those who are positive or critical of planting schemes. Regardless of this we found overwhelming support for Denbighshire County Council’s tree planting and wildflower meadow scheme and motivated residents that want to be part of such projects.

Appendix I. Online questionnaire

Below is the copy of the text of the online questionnaire. The exact same wording and format was delivered to both the national and Rhyl sample of respondents. All questions with the exception of postcode required an answer. The postcode question was optional. Included in the text below are the methods of recording answers e.g., tick box; free-text box, for information.

You are invited to take part in a research study. This should take no more than 5 minutes of your time. This research is being conducted by Bangor University, UK Centre for Hydrology and Ecology, and Denbighshire County Council. Thank you for taking the time to read this.

This survey is about Green Infrastructure (GI), which means the **natural spaces and corridors in a given area**. *We'd like to know your thoughts about trees and wildflower meadows as part of local GI development. You don't need any prior knowledge to participate. There are no 'right' or 'wrong' answers here - we are truly interested in your thoughts.*

Your responses will be held securely on password-protected computers, with data stored on a secure and encrypted server area. Anonymity will be maintained at all times; you won't be asked for your name.

If you agree to take part, you are still free to withdraw at any time by exiting the study and closing your browser; no problem.

This project has been approved by the College Research Ethics Committee of Bangor University.

Many thanks for reading this and we do hope you'll take part!

Q1. Consent Statement

I agree to my responses being retained indefinitely for further research by the researchers related to the topic of the study.

I understand that my participation in this questionnaire is voluntary and that I am free to withdraw at any time without giving a reason and without detriment to myself.
I understand that my data will be treated anonymously at all times.
I agree to take part in this questionnaire. (If you don't agree, you can close your browser window now. Thank you for your time!)

About You

Q2. What gender do you identify as?

[single option tick box]

1) Male
2) Female
3) Prefer not to say
4) Other

Q3. What is your age?

[single option tick box]

1) Under 18
2) 18-24
3) 25-34
4) 35-44

5) 45-54
6) 55-64
7) 65 and over

Q4. In which region of the United Kingdom do you live?

1) South West
2) South East
3) Greater London
4) East of England
5) West Midlands
6) East Midlands
7) Yorkshire and Humber
8) North West
9) North East
10) Scotland
11) Wales
12) Northern Ireland

Q5. What is your full postcode?

[free text box]

Q6. What is your highest level of education or qualification?

[single option tick box]

1) No formal qualifications
2) Secondary school (O-Level, GCSEs or equivalent)
3) Higher secondary or further education (A-Level, BTEC or equivalent)
4) University degree (undergraduate)
5) Postgraduate degree (Master or PhD)
6) Prefer not to say

Q7. How would you rate your personal interest in environmental matters?

[single answer tick box]

1. not at all interested
2. not very interested
3. neutral
4. somewhat interested
5. very interested

Q8. Please select the statement that you personally agree with the most:

"Thinking about changing tree coverage in my local area…"

[single answer tick box]

1. I would prefer much less trees
2. I would prefer somewhat less trees
3. I would prefer to keep it as it is
4. I would prefer somewhat more trees

5. I would prefer a lot more trees
6. I have no preference either way

Q9. Please select the statement that you personally agree with the most:

"Thinking about changing wildflower meadow coverage in my local area…"

[single answer tick box]

1. I would prefer much less wildflower meadows
2. I would prefer somewhat less wildflower meadows
3. I would prefer to keep it as it is
4. I would prefer somewhat more wildflower meadows
5. I would prefer a lot more wildflower meadows
6. I have no preference either way

Q10 What are your thoughts on changing tree coverage in your local area? Please select your preference for each place

[participants must select one option per row]

	Less trees	Keep the area as it is	More trees	I don't care
Park				
Along main Roads				
Along walking or bicycle routes				
Rural area				
Residential area near my home				
Residential area away from my home				
Town/city centre				

Q11. What are your thoughts on changing wildflower meadow coverage in your local area? Please select your preference for each place

[participants must select one option per row]

	Less wildflower meadows	Keep the area as it is	More wildflower meadows	I don't care
Park				

Along main Roads				
Along walking or bicycle routes				
Rural area				
Residential area near my home				
Residential area away from my home				
Town/city centre				

Q12. In your opinion, what would be benefits or disadvantages of your local Council planting more trees in your neighbourhood?

[free text box]

Q13. In your opinion, what would be benefits or disadvantages of your local Council establishing new wildflower meadows in your neighbourhood?

[free text box]

Q14. Do you see any relation between trees or wildflower meadows and climate change? If so, in what ways?

[free text box]

Appendix II. Rhyl residents interview questions

Below is a copy of the interview question sheet. Questions were posed exactly as delivered to each interviewee, in this order.

Part I

Woodland Creation

Q1. Do you notice trees in your local area?

Where?

Q2. How do you feel about trees?

Do they matter to you?

Do you have any feelings of connection to them?

Q3. How important is it for you to spend time among trees, for instance in a forest?

1 Extremely important
2 Important
3 Neither important nor unimportant
4 Unimportant
5 I avoid forests as much as I can

Q4. If it were up to you personally, where within your local area (your 'home patch') would you plant new trees?

Q5. **Are there places where you think there are too many trees?**

Q6. Do you feel that local woodland sites have changed in quality over the last year?
(scored on a five-point Likert scale; 1 = strong decline in quality; 2 = slight decline;

3 = no change; 4 = slight improvement; 5 = strong improvement).

Q7. Do you think more trees and woodlands in your neighbourhood would be of value?
Would it be good or not good for you personally?

Would it be good or not good for the community?

Q8. Is the management of trees (or maintenance) in your local area an important issue for you or not?

(scored on a five-point Likert scale; 1 = not at all important; 2 = not very important;

3 = neutral; 4 = somewhat important; 5 = very important)

Do you feel you have any influence on how these trees are managed?

Would you like to have more say in this or to be involved?

Q9. What benefits do you think new woodlands or trees planted in your local area provide?

Q10. What disadvantages would you see in new woodlands or trees planted in your local area?

Wildflower Meadows

Q1. Do you notice wildflower meadows in your local area?

Where?

Q2. How do you feel about wildflower meadows?

Do they matter to you?

Do you have any feelings of connection to them?

Q3. How important is it for you to spend time among wildflower meadows?

1 Extremely important
2 Important
3 Neither important nor unimportant
4 Unimportant
5 I avoid wildflower meadows as much as I can

Q4. If it were up to you personally, where within your local area (your 'home patch') would you establish new wildflower meadows?

Q5. Are there places where you think there are too many meadows?

Q6. Do you feel that the local wildflower meadow sites have changed in quality over the last year? (scored on a five-point Likert scale; 1 = strong decline in quality; 2 = slight decline;

3 = no change; 4 = slight improvement; 5 = strong improvement)

Q7. Do you think more wildflower meadows in your neighbourhood would be of value?
Would it be good or not good for you personally?

Would it be good or not good for the community?

Q8. Is the management of wildflower meadows (including monitoring or wildflower enhancement work) in your local area an important issue for you or not?

(scored on a five-point Likert scale; 1 = not at all important; 2 = not very important;

3 = neutral; 4 = somewhat important; 5 = very important)

Do you feel you have any influence on how these sites are managed?

Would you like to have more say in this or to be involved?

Q9. What benefits do you think the wildflower meadows provide?

Q10. What disadvantages would you see in establishing new wildflower meadows in your local area?

Part II

The next series of questions is about the associated benefits of tree planting or establishing wildflower meadows. Could you tell us how important they are for you personally and whether you feel that trees or wildflowers contribute to each benefit?

1) **Cleaning the air**
   How important is good air quality for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
   How much do you think woodlands help to improve air quality? (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
   How much do you think wildflowers help to improve air quality?
(*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*

2) **Flood protection**
   How important is reducing flooding for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
   How much do you think woodlands help with reducing flooding? (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
   How much do you think wildflowers help with reducing flooding?
   (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*

3) **Cooling on a hot day**
   How important is cooling for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
   How much do you think woodlands help with cooling? (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
   How much do you think wildflowers help with cooling?
   (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*

4) **Carbon storage**
   How important is storing carbon for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
   How much do you think woodlands help with storing carbon? (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
   How much do you think wildflowers help with storing carbon?(*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*

5) **Traffic noise reduction**

How important is reducing traffic noise for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
How much do you think woodlands help with reducing traffic noise? (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
How much do you think wildflowers help with reducing traffic noise?
(*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*

6) **Supporting biodiversity**
How important is supporting biodiversity for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
How much do you think woodlands help support biodiversity? (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
How much do you think wildflowers help support biodiversity?
(*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*

7) **Effects on health and wellbeing**
How important is improving health and wellbeing for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
How much do you think woodlands help improve health and wellbeing? (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
How much do you think wildflowers help improve health and wellbeing?
(*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much*

8) **Increase visual attractiveness of the area**
How important is the visual attractiveness of the area for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
How much do you think woodlands help improve the visual attractiveness of the area? (*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
How much do you think wildflowers help improve the visual attractiveness of the area?
(*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much*

9) **Opportunities for recreation**
How important is opportunities for recreation for you?(*scored on a five-point Likert scale; 1 = not at all important; 2 = not very important; 3 = neutral; 4 = somewhat important; 5 = very important)*
How much do you think woodlands help to provide opportunities for recreation?
(*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*
How much do you think wildflowers help to provide opportunities for recreation?
(*scored on a five-point Likert scale; 1 = not at all; 2 = not much; 3 = neutral; 4 = somewhat; 5 = very much)*

Part III

Q1. Why do you think Denbighshire County Council are creating woodlands and establishing new wildflower meadows?

Q2. Could you allocate a preference score from for each plot

(scored on a five-point Likert scale; 1 = strongly dislike ; 2 = somewhat dislike;

3 = neutral; 4 = somewhat like; 5 = strongly like)

[Images of places that have/planned interventions in Rhyl, include a map with each place marked.

1 Coronation Gardens

2 Olivia Drive

3 Holly Close

4 Hilton Drive

5 Rugby Club Walkway

6 Maes Gwilym

Could you please tell us why?

Q3. How many times in a typical fortnight do you visit these sites?

How long per visit?

Q4. Was the community engaged in the projects, do you think?

Q5. How do you think communities should be engaged?

Q6. To what extent do you feel included in woodland or meadow creation matters?

To what extent do you feel that you should be included?

What method/s of communication would you prefer?

What would you like to see done differently?

Q7. What level of detailed information about the woodland and wildflower meadow sites would you personally be interested in receiving by Denbighshire County Council?

1 = Low level e.g. the visual changes

2 = Medium level e.g. a blog post or story summarising the changes

3 = High level e.g. detailed information including results of species found and changes per site

4 = Not interested in any additional information

Q8. How would you personally prefer to receive information about the benefits of local environmental changes delivered by Denbighshire County Council?

1 = Council website

2 = Council social media pages

3 = Local newspapers or radio

4 = E-mails/e-newsletters from the Council

5 = Via my local councillor

6 = Signage within the community

7 = At organised site visits delivered by the Council's Biodiversity Team

8= Information sent to my home

Q9. As an individual or with your family would you consider getting involved in any tree or wildflower meadow activities?

Could you tell us which of these you would be interested in, if any?

1 = tree planting

2 = tree maintenance

3 = wildflower monitoring

4 = wildflower enhancement work

5 = other tree activity

6 = other wildflower meadow activity

7 = other activity to maintain them as safe and clean public spaces

Q10. Would you know who or where to contact to take part?

Appendix III. Benefits information

1). Online survey benefits.

This information was presented to half of survey respondents before Q8. They had to click to continue the survey. The same paragraph was given to half of interviewees.

Please read the information below before continuing with the survey

Climate-related problems like heatwaves and flooding, as well as air pollution, poor water quality, high noise levels and loss of biodiversity (rich and diverse plant and animal life) affect many of us. These have a range of human health impacts, such as increased stress levels, respiratory and cardiovascular problems and reduced life spans, and they have an economic cost.

Green and blue spaces such as parks, trees, gardens, rivers and lakes all provide a range of benefits which help make our local places more liveable. For example trees reduce air pollution, provide cooling on a hot day, can reduce surface water flooding, as well as store carbon and support biodiversity. Wildflower meadows are particularly good for supporting biodiversity; they also store carbon, and reduce air and water pollution and flood risk to some extent.

2). Interview benefits.

In addition to the paragraph above, interviewees who received additional benefits also read the below modelled benefits ahead of interview. This sample were allowed quiet time to read and ask any questions/receive explanation ahead of starting the interview. The paper copy was available for reference during interview.

One hectare of trees (approximately one and a half football pitches) can provide the following benefits (if planted in the right place):

	Benefit	Explanation
Noise	£887 in benefit from reducing road noise (for typical urban trees, but up to £2,165 if planted in key locations near to roads)	Wider strips of trees can reduce noise from roads. Lower noise levels result in less stress for residents, in turn giving health benefits such as a reduced risk of heart attack. Economists have calculated an economic value for this health benefit.
Air pollution	Removes 97 kg per year of air pollutants, with a value of £145 (based on data for Denbighshire)	Trees remove air pollutants, especially fine particulate matter which is extremely damaging to human health. Lower air pollution concentrations, lead to a reduced risk of health effects such as heart attack, breathing problems and reduced life expectancy. Economists have calculated an economic value for this health benefit.
Carbon	Holds 5.04 tonnes of Carbon, with value of £1,359	Trees store carbon in their trunk, branches and roots. Economists have calculated an economic value for this stored carbon.

Appendix IV. Participant information sheet

Copy of the participant information sheet supplied to all interviewees. This gave details about the study as well as basic information about DCC's GI schemes. All interviewees were asked to read and understand this document, supplied in duplicate paper copy, ahead of signing the Consent Form, also in duplicate paper copy.

Research Project:

'Community Perceptions of New Greenspace Interventions in Rhyl'

I would like to invite you to take part in a research study. Before you decide on taking part you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or if you would like more information. Take time to decide whether or not to take part.

The Study

As part of its Climate and Ecological Change Strategy, Denbighshire County Council is planning to develop new green infrastructure, including tree planting and urban wildflower grasslands in Rhyl. Bangor University is conducting interviews with Rhyl residents to learn more about the community's perceptions of and responses to schemes of this kind. This research project is funded by the UKRI-funded RECLAIM Network Plus grant (EP/W034034/1).

The Denbighshire County Council Wildflower Meadow Project started in 2019 and there are now over 100 sites in the county. Wildflower meadows vary from site to site and usually contain a variety of native grasses and wildflowers. The wildflowers at the sites are mostly native perennial species, which return and flower each year.

Denbighshire County Council's Woodland Creation Project began in 2017 and has to date planted over 18,000 trees, including nearly 5,000 trees across the county in 2022. 2,500 of these new trees have been planted in Maes Gwilym, Rhyl.

These interviews are to gain understanding of Rhyl residents' perceptions of schemes of this kind: any benefits of or concerns about such interventions, beliefs about the reasons and rationales of the schemes, and the decision-making process of what is planted and planting locations.

What will taking part involve?

Taking part in this study will involve completing a 5 minute survey (online) followed by a one-to-one conversational questionnaire with the Researcher in a safe, public space at a mutually-agreed time and date. The topic is the planting schemes (trees and wildflower meadows) in Rhyl. You will not be asked about anything beyond this topic and you do not need to know anything in advance.

Taking part will take no more than an hour and you will receive £10 in cash for your contribution. The discussion will be audio recorded and later transcribed by the Researcher. You can choose to have your interview and any supporting reading materials in English, Welsh or both. It is important that you answer questions in the language you are most comfortable.

Why have I been invited to take part?

You have been invited as you are a Rhyl resident living nearby to existing and/or proposed planting sites. We want to gather the views of those who are impacted by schemes of this kind and are likely to encounter the planting sites regularly.

Do I have to take part?

Participation is completely voluntary and you have the right to refuse participation, refuse any question and withdraw at any time without any consequence whatsoever.

Will taking part be confidential?

Yes. The study has received ethical approval from Bangor University. The data will be stored on university encrypted laptops and we will remove all potentially identifying, personal or sensitive information. Any results will be anonymised. Any information you provide will be stored and protected in accordance with data protection.

What will happen to the results of this study?

The results of this study will inform the production of user-focused guidance documents for use by county councils and residents. A blog post on the project will be submitted to the funders and the findings of this research may be published in academic journals.

Who should I contact for further information?

In the first instance please contact the Researcher:

Dr Sofie Roberts

Bangor University

Cop402@bangor.ac.uk

If you would prefer to speak with a manager, please contact the Academic Lead of the project:

Professor Thora Tenbrink

Bangor University

t.tenbrink@bangor.ac.uk