An Analysis of Opinions on Wetland Management Practices by the Irish Ramsar Wetlands Committee

Salt Marsh at Bull Island, Dublin City by John Fox

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A report commissioned by the Environmental Protection Agency and prepared by BirdWatch Ireland

September 2018

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Executive Summary

Wetlands comprise approximately 6% of the earth's surface area and are essential for many ecosystem services such as water purification, flood attenuation, and climate change mitigation. Despite this, within the last century, their destruction has accelerated rapidly. In response, the Ramsar Convention was set up in 1971 to provide a framework for the protection, restoration and conservation of wetlands at a national and global scale. One of the key aspects of the treaty is its collaborative nature. This is essential due to the complexity of wetland ecosystems, their differing functionalities, interconnectedness, and the fact that they can often span international boundaries.

In keeping with this spirit of collaboration, the Irish Ramsar Wetlands Committee, (IRWC), which was founded to protect wetlands in Ireland, carried out two small scale surveys in June 2016 at the Inaugural International Conference on Natural and Constructed Wetlands hosted by National University Galway. The aims of these surveys were to gather feedback from conference participants on differing aspects relating to the Ramsar Convention, issues and management strategies pertaining to wetland conservation, and the sense of connectedness of delegates to these habitats. It is hoped that the feedback from these surveys will go some way towards informing future wetland management practices in Ireland.

This report summarises and discusses the key themes obtained from both surveys. A number of principal themes came to light during the analysis of the data collected from survey participants. Most delegates were aware of the Ramsar Convention and in favour of the broadness of the Ramsar definition of wetlands. In terms of issues surrounding wetland ecosystems at both a local and international scale, drainage and reclamation was the most frequently cited threat. However, climate change was significantly more frequently cited as a threat to wetland ecosystems at a global rather than on a local scale. This is in line with previous research which has highlighted that climate change is more easily understood at an abstract or global scale, rather than at a local level.

Volunteers were also viewed by participants as essential to the conservation of wetlands. The principal areas of activity suggested for volunteers were citizen science, education and community engagement/amenity services. Education was also the most popular method for promoting wetland conservation and ecosystem services to communities. Regarding survey participants'

sense of personal connection to wetlands the intrinsic value of the experience of wetland habitat and species appears to be more important to the majority of respondents, than the functionality of either. This indicates the necessity of experiencing nature and wetland habitats in order to fully appreciate them. Fostering this sense of appreciation can in turn bolster individual and community support for conservation measures, which in turn will increase the success of such efforts. These themes, answers and recommendations provided by survey participants to a variety of questions are analysed and discussed herein.

The report concludes with a summary of the key findings of the analysis and makes a number of recommendations for actions that might be taken on board by the Irish Ramsar Wetlands Committee and its partners, together with suggestions for future studies.

1. Introduction

The Ramsar Convention is an intergovernmental treaty which sets out a framework for the wise use and conservation of wetlands. Established in 1971, currently one hundred and sixty - nine countries have signed up to it. Ireland became a signatory to the Convention in 1985. Contracting parties to the treaty commit to three principal aims;

Table 1: Aims of Ramsar Convention.

Aims
1. To work towards measures which will enable the wise use of wetlands
2. To designate wetlands which meet some, or all, of the relevant criteria to be considered internationally significant and ensure their effective management
3. To cooperate with other governments and agencies when Ramsar designated wetlands cross international boundaries, and when such wetland sites and species are shared

(Ramsar n.d.)

The Ramsar Convention broadly defines wetlands as *"areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres."* (Ramsar 2016). This broad framework has been introduced to allow for rapid identification of wetland habitats by contracting parties (Ramsar n.d.).

The importance of wetlands has been widely acknowledged for the ecosystem services which they provide, including but not limited to carbon sequestration, flood attenuation, biodiversity and water filtration (Ramsar n.d.). Although the importance of wetland ecosystems is widely acknowledged, the Ramsar Secretary General, Martha Rojas – Urrego recently stated that "wetlands are being lost faster than forests." In fact, it is estimated that approximately 64% of wetlands have been lost globally since 1900 (Ramsar 2017). Principal threats to wetlands on a global scale are drainage and development of wetlands for industrial and agricultural use, invasive species, pollution, climate change and the erection of dams (WWF 2017).

In Ireland, the key threats to wetlands according to the National Parks and Wildlife Services are peat cutting, drainage/reclamation, over – and – under grazing, water pollution, unsustainable harvesting, invasive species and recreational pressures. They also indicate that a lack of public

awareness regarding the value of these ecosystems and the services they provide, in conjunction with population growth is contributing to the increasing degradation and decline of these habitats in Ireland (EPA 2016).

In an attempt to conserve and protect Irish wetlands, the Irish Ramsar Wetlands Committee (IRWC), was established in 2010 by then Minister for the Environment, Heritage and Local Government, John Gormley. The aims of the Committee are to "(i) raise the profile of all wetlands and their value in Ireland, (ii) develop national wetland policies, and to provide advice to policy makers, (iii) support wetland education and public awareness of wetlands, (iv) promote the implementation of the Ramsar Convention in Ireland and (v) ensure that the above objectives are consistent with the Ramsar Convention and with approaches taken by other national Ramsar Committees across the globe." (IRWC n.d.).

Ongoing research into wetland ecosystems such as that carried out by the IRWC and other groups, complements the Environmental Protection Agencies 2020 Vision environmental goals. These are;

Table 2: EPA 2020 Environmental Goals.

Environmental Protection Agencies 2020 Vision Environmental Goals	
(1) Limiting and adapting to climate change	(4) Protect soil and biodiversity
(2) Clean air	(5) Sustainable resource use
(3) Clean water	(6) Integration and enforcement

(EPA 2000).

To achieve these goals, input from a wide variety of interest groups, academics and individuals are required to gain a better understanding of the challenges and potential solutions to the pressures facing wetlands. This study attempts to increase the knowledge base available for management strategies in the future.

2. Methods

2.1. Aims of the IRWC survey

The aim of this survey was to gather information from a range of persons of diverse backgrounds and countries, on issues surrounding wetland management, and potential conservation measures. The questions asked can be broadly categorised into three main aims:

Table 3: Aims of the survey.

Survey Aims
(1) To assess the understanding of respondents on issues pertaining to wetlands, their ecology and conservation.
(2) To assess the personal connection of respondents to these ecosystems.
(3) To gather additional information on pressures and management strategies pertaining to wetland ecosystems.

2.2. Survey methods

The Inaugural International Conference on Natural and Constructed Wetlands was hosted by National University of Ireland Galway on 21-22 June 2016. This event was open to a wide audience from around the world including scientists, engineers and students and also encompassed a wide range of wetlands both natural and constructed. The Irish Ramsar Wetlands Committee, (IRWC), conducted small-scale survey at a conference side event in order to gauge peoples' perceptions and knowledge of wetlands and the Ramsar Committee itself. The survey consisted of two parts – a questionnaire handed out in each conference pack and a 'Speed-Dating for Aquatics' event which everyone was invited to attend. At this event, participants were paired up (teams of two) and asked to discuss a series of wetland - related questions. A total of 30 delegates participated in the questionnaire survey provided during the conference, while 15 teams took part in the 'Speed - Dating for Aquatics' event. The results are therefore representative of a rather limited data set.

2.3. Survey analysis

Questionnaires from both the conference and the Speed Dating for Aquatics event were digitised. Each question and its associated answer was then entered into Microsoft Excel. The key themes were listed for each response and grouped, to gain an overall understanding of any emergent trends.

Questions were then organised according to similarities observed in their overall aims. Answers to each question asked and the key themes drawn from them, were analysed and discussed under the category headings listed below in the Results and Discussion sections. The four main categories identified were

- Participant's background and knowledge of the Ramsar Convention
- Participant's input into technical issues surrounding wetland ecosystems
- Participant's views on volunteer and community engagement
- Participant's connection to wetland ecosystems

Figure 1: Participants in the 'Speed Dating for Aquatics Event' *Paul Johnston*

3. Results

3.1. Delegate background, knowledge and assessment of the Ramsar Convention

3.1.1. Background and knowledge

Participants were drawn from a diverse array of countries and professional backgrounds. The majority of respondents worked in Ireland (67%), with the remaining delegates working across Europe, the United States and Australia. A high proportion of respondents were employed in the Academic Sector (44%), with Public Authorities comprising the second highest professional group among participants, (24%), (see Tables 4 & 5 below).

Table 4: Country of Employment

Country of Employment	Percentage for Each Country
Ireland	67%
UK	10.5%
USA	10.5%
Australia	3%
Belgium	3%
Czech Republic	3%
Poland	3%

Table 5: Professions of delegates

Profession	Percentage for Each Profession
Academic	44%
Public Authority	24%
Consultant	13%
Other	13%
NGO	3%
Volunteer	3%

Most participants were aware of the Ramsar Convention, with only 10% of respondents indicating that they were unaware of the treaty. A total of 23 participants provided information on their concept of the Ramsar Conventions aims. An analysis of key words revealed that the most commonly cited aim was protection of wetlands, (61%), with wise use (35%) and conservation (30%) also frequently mentioned. See Table 6 below for a full list of key words and their respective percentages.

Table 6: Percentage of key words used by survey participants when discussing Ramsar Convention aims.

Main Aim of Ramsar Convention	Percentage
Protection	61%
Wise Use	35%
Conservation	30%
Designation	17%
Awareness	13%
Sustainable	9%
Cooperation	4%
Education	4%

In response to the question, *"Is there a Ramsar Committee in your country?"*, 83% of respondents indicated that there is, while the remaining 17% stated that they were uncertain. In response to the question, *"Is there a Ramsar Committee in your country?"*, 83% of respondents indicated that there is, while the remaining 17% stated that they were uncertain. Of those that said 'Yes' to the question above, 92% indicated that the Committee was active, while 8% were not certain on this point.

3.1.2. Participant's assessment of Ramsar

Delegates were asked to discuss the broadness of the wetland classification currently in use by the Ramsar Convention. Of the twenty-seven responses to this question, 59% stated that the classification is not too broad, 30% were uncertain and 11% indicated that it is too broad. The most common reason put forward for retaining a broad classification of wetlands was that all bodies of water or areas subject to influxes of water, such as tidal areas, require protection. The interconnectedness of these ecosystems was also put forward as a defence for the classification. The arguments put forward by those who responded "maybe" to this question were more diffuse. However, they largely centred around the need to differentiate between wetlands of greater and lesser significance and the implications of a broad classification for defining wetlands at an individual scale.

Table 7: Breakdown of opinions on Ramsar classification of wetlands.

Is the Ramsar Classification of Wetlands Too Broad?		
Answer	**%**	**Principal Reasons Provided by Respondents**
Yes	11%	Different wetland ecosystems have differing functions and services There is a need to clarify what size constitutes an important wetland site Prioritisation should be given to natural rather than constructed wetland habitats
No	59%	All wetlands have value and are interconnected
Maybe	30%	Need to differentiate between wetlands of greater and lesser significance A broad definition may increase difficulties when defining a wetland

Of the three respondents who stated that the classification is too broad, the arguments for this position centred around the inclusion of wetland types which have different functions and ecosystem services, the need to clarify the size of wetlands and whether these are natural or constructed. A theme which was mentioned by three of the thirty respondents was the need to collaborate with other organisations to ensure that while retaining a broad classification, resources of those enforcing the regulations of the treaty for such a variety of sites do not become overstretched.

Participants were then asked more specifically about the inclusion of lakes, rivers and estuaries in the Ramsar Conventions classification of wetlands. A slightly higher proportion of participants, (46%), indicated that all three of these ecosystems should continue to be classified as wetlands by the Ramsar Convention. The overwhelming reason for this view was that such ecosystems are all interconnected and thus an impact upon one, affects another.

Of those participants that indicated that none of these ecosystem types should be included in the classification (39%), the main argument was that these are differing ecosystems, with different functions and services. One of the suggestions in this category was to instead call them ‘waterbodies’ for greater clarity and to ensure that the protective measures they require are implemented and maintained. Two respondents (7%), indicated that while estuaries should be

retained within the classification, rivers and lakes should be removed. No further information was provided for the reasons behind this opinion.

3.1.3. Relevance of the Ramsar Convention to Europe Considering the Water Framework Directive (WFD)

Of those participants that responded to the question, *"Is the Ramsar Convention relevant to Europe – with the WFD and Habitats Directive in place?"*, 83% indicated that it is, while 17% stated that they are uncertain. No respondents answered no to this question and no further elaboration could be drawn from responses to this question.

3.2. Participant's input into technical issues surrounding wetland ecosystems

3.2.1. Relevance of Wetlands to Climate Change

Respondents were asked about the relevance of wetlands to climate change. According to respondents, the main ways that wetlands can mitigate the effects of climate change are through carbon sequestration, (86%), and flooding attenuation, (76%). The third most commonly cited answer was water purification (31%), (see Figure 2 below for an overview of answers).

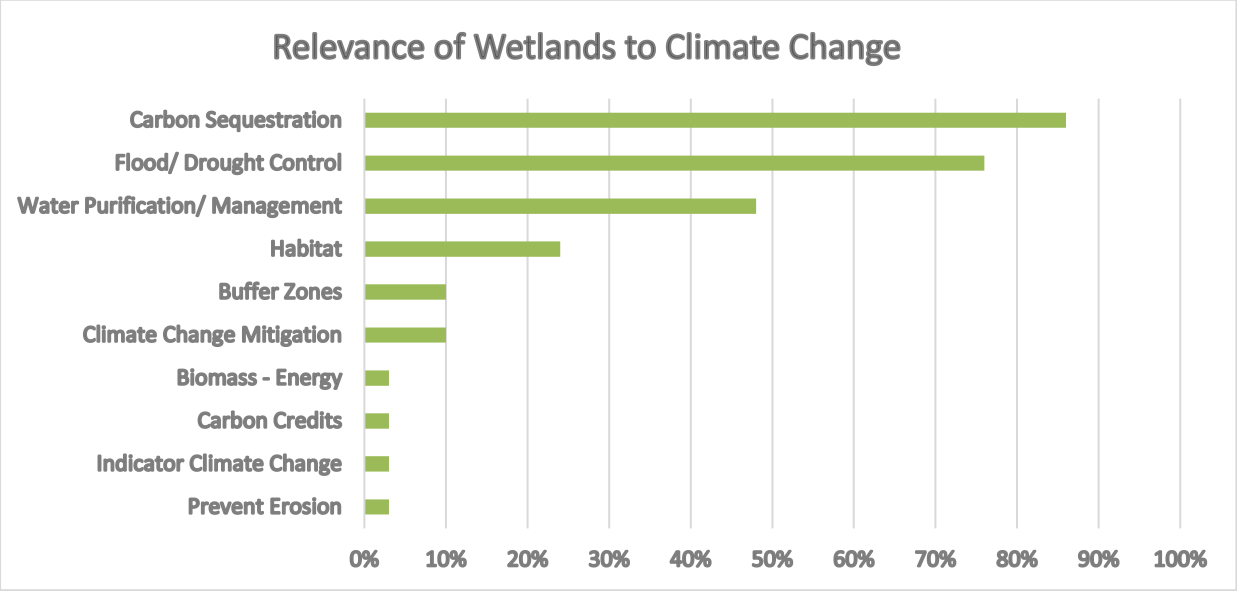

Figure 2: Percentage of opinions on aspects of wetlands which make them relevant to climate change

3.2.2. Principal threats to wetlands in delegate's country of work

When asked about the principal threats to wetlands in their countries; drainage, reclamation and development were listed in 76% of responses. Throughout the remainder of this document, all references to drainage and reclamation will also include development. No other activities were as strongly associated with wetland destruction. Pollution, (24%), lack of government will (17%), lack of public awareness (17%), and flooding (17%), were also considered principal threats by a number of respondents.

Participants often cited drainage/reclamation, pollution and eutrophication when referring to urbanisation, infrastructure, or agricultural and industrial sectors. In such instances, the outcome, i.e. drainage/reclamation etc. was listed rather than the sector as a principal threat.

When participants did not elaborate upon the outcome from such sectors but instead mentioned only the sector, i.e., agriculture etc., this was instead listed as a perceived principal threat. As such the frequency of responses which indirectly referenced drainage/reclamation, eutrophication or pollution could be higher than is immediately perceptible. Due to this, such processes have been analysed separately. Within this subcategory, agriculture was cited more frequently than infrastructure development, urbanisation and industrialisation as a threat to wetland ecosystems on a national scale (see Table 8 below).

Table 8: Percentages of respondents which cited specific sectors as principal threats to wetlands.

Activity	Percentage of Answers
Agriculture	24%
Infrastructure	7%
Urbanisation	7%
Industrialisation	3%

3.2.3. Principal threats to wetlands in country of work: Irish participants vs. international participants' views

A comparison of the key issues which Irish participants and delegates working outside Ireland felt impacted wetland systems in their own countries highlighted some interesting similarities and

differences in areas of concern. Both Irish and international participants viewed drainage/reclamation as the principal threat to wetland ecosystems in their countries. However, the prevalence of this answer was higher in Irish participant responses (85%), than among international delegates (56%). Sixty percent of Irish participants directly mentioned peatlands when answering this question. This perhaps provides some indication of why drainage/reclamation was more prevalent in responses from Irish participants than in opinions obtained from delegates outside of Ireland.

Delegates working outside of Ireland viewed pollution as the second most prevalent factor contributing to wetland decline in their country (44%). By comparison, the proportion of responses which cited pollution as a major contributing factor to wetland decline was only 15% among delegates working in Ireland. A relatively similar proportion of delegates working in Ireland, and outside of the Irish state, viewed a lack of public awareness and government willingness, (Ireland: 15% respectively; International: 22% respectively), as a principal threat to wetlands in their countries. Climate change was infrequently mentioned by both delegates working in Ireland (5%), and those working abroad (11%).

Table 9: Comparison of perceived principal threats to wetlands by delegates working in Ireland and abroad.

Principal Threats to Wetlands	Ireland	International
Drainage/Reclamation	85%	56%
Pollution	15%	44%
Lack of Public Awareness	15%	22%
Lack of Government Will	15%	22%
Climate Change	5%	11%

Among delegates working in Ireland, agriculture was the second most frequently referenced threat to wetlands. By contrast, among delegates working internationally it was the third most frequently cited threat to wetlands in their countries. Despite this, the percentage frequency of this answer was relatively similar between both groups (Ireland: 25%; International: 22%). It was also more frequently cited by both groups than urbanisation, infrastructure and industrialisation.

While industrialisation was referenced in 11% of answers provided by participants working outside of Ireland, it was never cited by those working in Ireland.

Table 10: Comparison of specific sectors perceived as principal threats to wetlands by delegates working in Ireland and abroad.

Principal Threats to Wetlands	Ireland	International
Agriculture	25%	22%
Urbanisation	5%	11%
Infrastructure	5%	11%
Industrialisation	0%	11%

3.2.4. Perspectives on global wetland decline

Participants were asked for three key reasons for the decline of wetlands on a global scale. Once more the proportion of answers which cited drainage/reclamation was higher than for any other category listed (87%). Pollution and lack of public awareness were mentioned at a similar rate, (23% and 20% respectively), for global declines as that associated with wetland loss on a national scale (24% and 17% respectively). However, climate change was cited more frequently when addressing global declines in wetlands (33%), compared to similar declines within participant's own countries (7%).

On a global scale, agriculture once more was viewed by many participants as a major contributing factor to wetland decline. However, the percentage of participants who mentioned agriculture as a leading contributor to global wetland decline (53%), was significantly higher than that cited for wetland destruction within a national context (24%). Urbanisation was also mentioned in a higher proportion of responses (27%), when addressing wetland loss globally than at a national level (7%). The impact of industrialisation was mentioned a proportionally equal number of times for both global and national wetland loss (3%). By contrast, while infrastructure development was not mentioned as a primary threat at a global scale, 7% of respondents indicated that they viewed it as a primary cause of wetland decline at a national level.

Table 11: Comparison of delegate opinions for wetland decline in their countries of work and globally.

Activity	National Reasons for Wetland Decline	Global Reasons for Wetland Decline
Drainage/Reclamation	76%	87%
Pollution	24%	23%
Lack of Public Awareness	17%	20%
Lack of Political Will	17%	0%
Climate Change	7%	33%
Habitat Loss	14%	0%
Flooding/Flooding Attenuation	17%	0%
Overpopulation	0%	17%
Eutrophication/Nutrient loss	10%	7%
Altered hydrology	7%	7%
Agriculture	24%	53%
Urbanisation	7%	27%
Industrialisation	3%	3%
Infrastructure development	7%	0%

On a global scale, agriculture once more was viewed by many participants as a major contributing factor to wetland decline. However, the percentage of participants who mentioned agriculture as a leading contributor to global wetland decline (53%), was significantly higher than that cited for wetland destruction within a national context (24%). Urbanisation was also mentioned in a higher proportion of responses (27%), when addressing wetland loss globally than at a national level (7%). The impact of industrialisation was mentioned a proportionally equal number of times for both global and national wetland loss (3%). By contrast, while infrastructure development was not mentioned as a primary threat at a global scale, 7% of respondents indicated that they viewed it as a primary cause of wetland decline at a national level.

3.2.5. Measures to conserve and protect wetlands within delegates countries of work

Twenty-three participants indicated that there are measures in place within their own countries to conserve and protect wetlands. Three participants did not answer this question, while four delegates stated that they were unsure if there are any measures in place in their own countries to protect wetlands. Three of these last participants were working in Ireland, while one was working in Belgium.

Of those participants that answered 'Yes' to this question, the measures put in place varied and were centred around legislation. Due to the variety of answers provided, these have been tabulated below with frequency and associated countries.

Table 12: Breakdown of conservation measures in delegate's country of work by frequency of answers and country.

Protection and Conservation Measure	Frequency	Participant's Country of Work
National, State and local legislation	3	Australia, USA, Ireland
Habitats Directive, Groundwater Directive, Birds Directive, WFD	3	Ireland (2), UK (1)
EU and national legislation/designations	3	Ireland (3)
Restoration bogs/floodplains	1	Czech Republic
Planning process required for drainage projects, etc.	1	Ireland
EA/NRW/SEPA	1	UK
State S.I. Implementations	1	Ireland
NHAs, Natura 2000, Ramsar sites	1	Ireland
Peatlands Plans, communities	1	Ireland
Not Answered	16	

3.2.6. Feedback on political acceptability and economic viability of managed retreat

Participants in the Speed Dating event were asked if managed retreat as a coastal management strategy was politically acceptable and economically viable in their regions. A total of ten answers

were selected for this question as three answers were not deemed to have addressed the issue. Ten percent of respondents (one team), indicated that this was an acceptable strategy in their region, although they stated that they did not reside in a coastal region. Of the remaining participants, 50% indicated that this was not considered politically acceptable in their region, while 40% were uncertain.

In terms of economic viability, 40% of respondents indicated that this was considered feasible, while 50% were unsure. The remaining 10% of respondents indicated that it was not considered viable in their area. Of the respondents that answered 'Yes' to this question, a number of these respondents indicated that while it is viable in the long term, the initial short - term costs may restrict uptake of this solution.

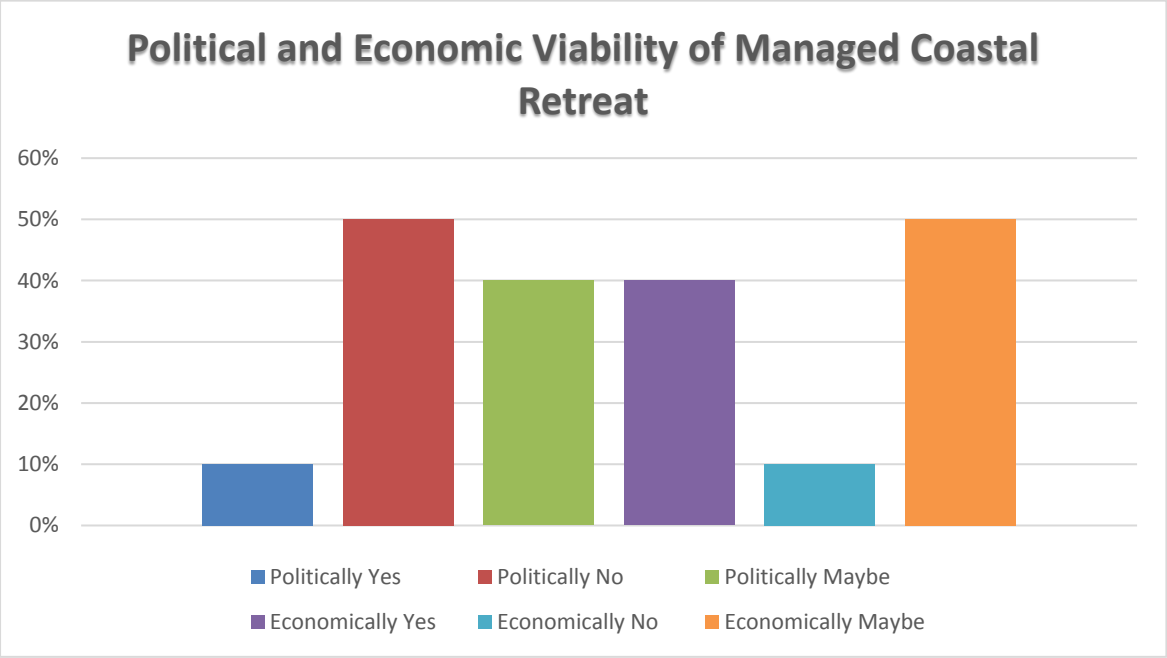

Figure 3: Delegate opinion on the political and economic viability of managed coastal retreat.

3.2.7. Proposed viable soft engineering solutions for flooding control in urban and rural areas

Respondents most frequently cited the creation of Integrated Constructed Wetlands, (ICWs), and the use of swales, trees and reeds as two of the most viable soft engineering solutions for resolving flooding issues in urban areas. Regarding the creation of ICWs in urban areas, one participant expanded upon the point indicating that these could become wetland parks and perhaps be integrated into housing estates.

The implementation of Sustainable Drainage Systems (SuDS), was also frequently referred to for urban areas. One answer did not clarify this as a solution for urban environments, but as this is a method used for urban areas, it was included in the urban category. In all other cases, when respondents did not specify their answer as either related to rural or urban strategies, they were placed into a "Not Specified" category as displayed in Figure 4 below. The use of swales/trees and reeds was the most common suggestion for rural areas, with the restoration of wetlands, particularly raised peat bogs, the second most frequent response.

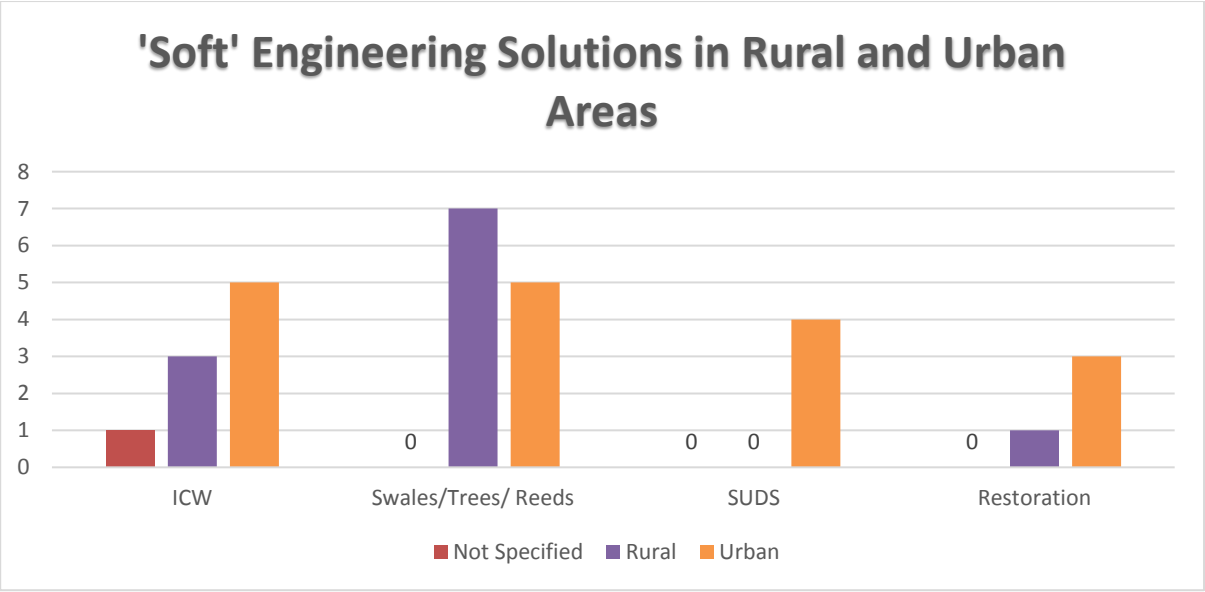

Figure 4: Proposed soft engineering solutions for rural and urban areas.

3.2.8. Feedback on the viability of constructed wetlands as waste treatment facilities in the present and future

One of the questions posed to speed dating teams was *"Constructed wetlands - a solution to waste now or a problem when overloaded in the future?*". Participants were asked to discuss their views and opinions on this subject. Five out of the twelve teams indicated that they considered constructed wetlands a solution to waste now. The remaining teams did not address this section of the question.

Two out of the twelve teams, (17%), indicated that they did not view overloading of wetlands as a potential problem in the future. Of these two teams, one suggested that as wetlands are often not considered as a solution to waste management, the possibility of such ecosystems becoming overloaded will not occur. The other team who responded in the negative to this question stated

that constructed wetlands are now so well understood that future overloading of these systems could only occur through poor design.

Most respondents, (75%), indicated that this could potentially be a problem in the future. Interestingly, similarly to one of the two teams which answered “No” to this question, most respondents suggested that overloading could only occur through poor design and/or poor management. Several teams indicated that in addition to this, overloading with contaminants which have a long half-life such as heavy metals is an issue which needs to be addressed presently. Only one team, (8%), answered definitively that while in the short term constructed wetlands are a solution to waste, overloading will be an issue in the future due to costs associated with sediment control.

Table 13: Feedback on the potential for constructed wetlands to be overloaded in the future.

Question-Will Overloading of Constructed Wetlands be a Problem in the Future?		
Response	**Percentage**	**Main Theme of Answers**
Yes	8%	Costs of sediment control are prohibitive and as a result overloading will occur
No	17%	Wetlands not always considered a solution to waste and thus will not be overloaded in the future Knowledge of constructed wetland design and maintenance so established overloading could only occur through poor design
Maybe	75%	Overloading could potentially occur due to poor design/management Longevity of contaminants could lead to overloading of constructed wetland systems

3.2.9. Relevance of a hydrological understanding of a wetland's function to its conservation

During the 'Speed Dating' session, participating teams were asked if *"a hydrological understanding of a wetland's function… (is)… essential for its conservation?"* Most teams indicated that in their opinions it is important (73%). By contrast, 27% of participating teams felt that the necessity of a hydrological understanding of a wetlands function was dependent on several factors. For these participants, an understanding of the hydrology of a wetland ecosystem was not of paramount importance when; (i) wetland ecosystems are functioning well; (ii) for local people who simply wish to enjoy the wetland habitat, (iii) in the case of loughs/lakes as these are artificially maintained, and (iv) for the conservation of wetlands where it is 'useful but not essential'.

However, for the majority of participants irrespective of whether they answered 'Yes' or 'Sometimes' to this question, restoration, management and protection were the key reasons given for considering that hydrological understanding of a wetlands function is essential for its conservation. An overview of the most common themes derived from elaboration on why a hydrological understanding is essential for the conservation of wetlands is given in Table 14 below.

Table 14: Reasons provided for why a hydrological understanding of a wetlands function is essential for its conservation.

Reasons why a Hydrological Understanding of a Wetlands Function is Essential for its Conservation According to Survey Participants
Useful for restoration and management
Useful for the protection of wetlands within the wider catchment context
Essential for impact assessments of activities
Critical for the design of Integrated Constructed Wetlands
Informs understanding of ecosystem services
Informs management practices of local communities/farmers
Water availability and quality impacts species (flora and fauna) present

3.2.10. Proposed areas for future academic research

Respondent's answers to the question, *"What academic research is currently needed for wetland conservation?"* can broadly be broken down into three categories; ecological, political and community research. The need for academic study of community relationships to wetlands was cited by five responding teams (33%), political research was discussed by four teams (27%), while the need for various strands of ecological research was included in 100% of answers.

Of the five responding teams that suggested that community interaction with wetlands required further research, 57% indicated that a greater knowledge of community perceptions, understanding and approaches to wetland conservation is necessary. The remaining 43% of suggestions on this topic focused on researching ecosystem services and benefits to communities. No further elaboration was provided upon these suggested avenues of academic research.

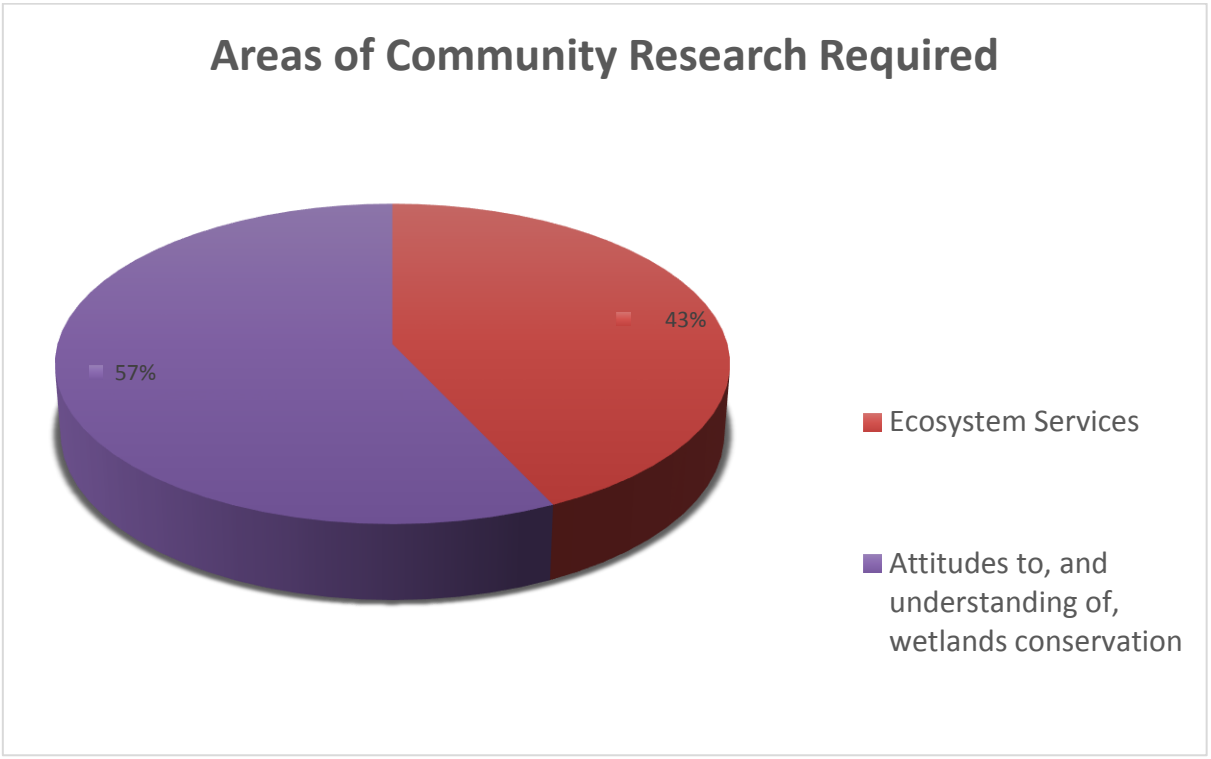

Figure 5: Proposed areas of research for communities

Within the answers provided by four of the teams that cited political research as a key requirement for academic study, research into funding/compensation was mentioned twice. One participating team noted that investigative research should be conducted into government funding which encourages the destruction rather than conservation or restoration of wetland

ecosystems. The impact of sectoral activities and the necessity of investigating how to integrate the Water Framework Directive into the Habitat Directive was also regarded as requiring further research by two teams respectively.

Table 15: Proposed areas of research into political involvement

Academic Research Required for Political Involvement
Research into increased funding and compensation to farmers/landowners
Researching cash flows and how they are used in terms of conservation vs. land destruction
Research into the impact of sectoral activities
Research into integrating the WFD into the Habitats Directive

Within the 'Ecology' category, a number of diverse research needs were discussed. For ease of discussion and understanding these have been divided into subcategories and graphed according to the number of responding teams that cited such subcategories at least twice.

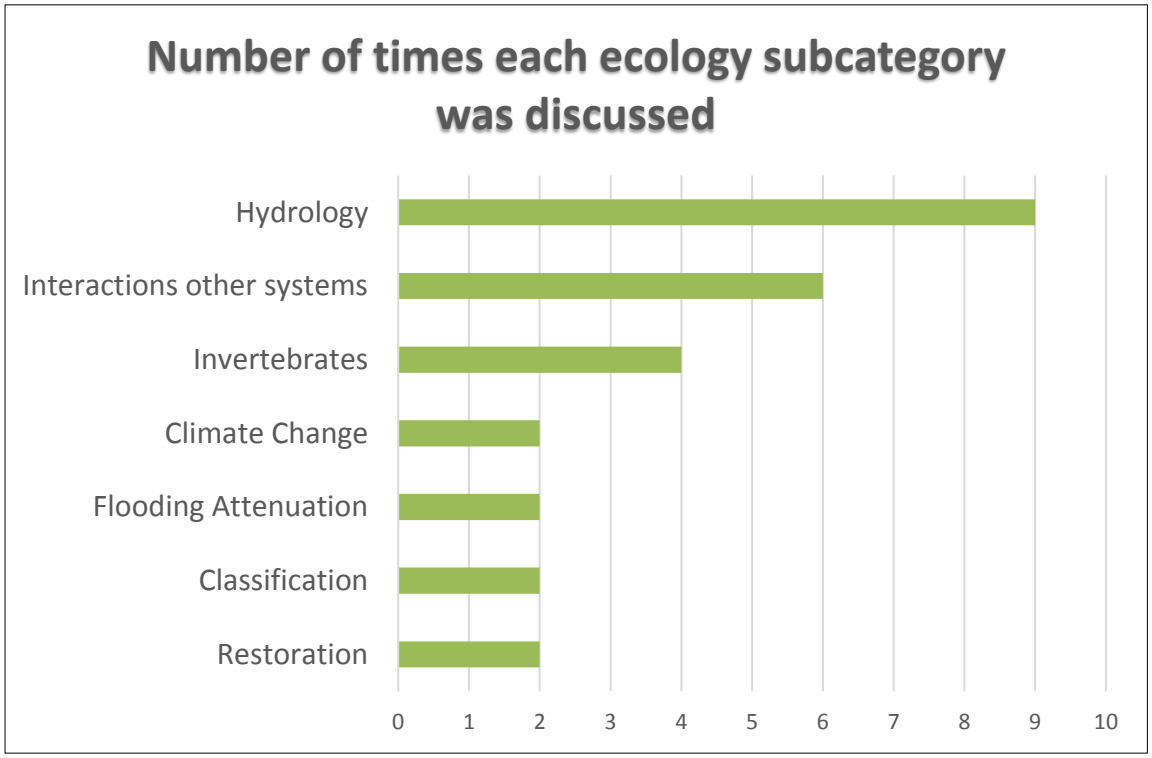

Figure 6: Frequency of responses which cited specific subcategories of ecological research required.

The most commonly cited subcategory was 'Hydrology'. Many respondents simply stated hydrology or hydrological processes as requiring further research. However, among those respondents which elaborated further upon the topic, the following points were provided;

Table 16: Proposed areas of academic research into the hydrology of wetlands.

Potential Areas of Academic Research on the Hydrology of Wetlands
Baseline data on the hydrological needs of species of conservation interest needs to be collected
Research needs to be collected on the ecohydrology and ecosystem functioning/services of pristine sites
Meaningful hydrological monitoring needs to be conducted
The ecohydrology of fens requires further research
The hydrology of integrated constructed wetlands deserves more extensive research
Academic research on the links between the hydrological processes of an ecosystem and its ecology

The second most frequently cited topic requiring further research was interactions with other systems. Within this subcategory, the topics which respondents wished academic research to focus upon differed to some degree. It encompassed the need to identify ecological relationships and the role of integrated catchment areas, the necessity for understanding biogeochemical benefits, understanding the role of wetlands within the wider ecosystem and funding multi-disciplinary research studying their wider role and impacts.

Invertebrate ecology was the third most frequently discussed topic which respondents felt required greater academic research. Of the four teams mentioning this potential area for research, the following responses were provided;

Table 17: Proposed areas for further academic research on wetland invertebrate species.

Potential Areas of Academic Research on Wetland Invertebrate Species
Integrated study of the interaction between macroinvertebrates and water purification
Utilising wetland invertebrates as bioindicators
The role of wetland dependent animals particularly invertebrates in the overall ecology of wetlands
Greater understanding of invertebrate communities in wetland ecosystems

The final four topics which respondents felt required greater academic study were; climate change, flood attenuation, classification of wetlands and restoration of wetland ecosystems. Elaborations provided on each of these topics are tabulated below;

Table 18: Overview of themes arising within the final four subcategories proposed for further academic research.

Expansion on the Final Four Subcategories for Potential Academic Research	
Climate Change	Effect of climate change on biodiversity in the long term Maintaining biodiversity as climate change accelerates Assessing the impacts of climate change
Flood Attenuation	Potential for flood attenuation Impacts of flooding and flood maintenance projects on wetlands
Classification of Wetlands	Classification of fen ecosystems Simpler classification system for wetland ecosystem types
Restoration	Increased research into restoration of wetland habitats

A number of potential research topics were also mentioned by participants which could not be grouped into subcategories and instead have been labelled 'Other'. Each of these proposed areas of research was mentioned just once across all answers to the question. The topics mentioned were relatively diverse and have been tabulated below to provide indications of potential research which may be undertaken at a future date.

Table 19: Proposed topics for further academic research which could not be categorised.

Further Topics for Academic Research
Microbiology
Development of management guidelines for various wetland ecosystems
Development of an inventory for Irish wetlands
Improvement of modelling systems
Research on the paleoecology of wetlands when pristine wetlands are not available
Comprehensive vegetation surveying and monitoring which extends beyond Article 17
Research into the dose response for biotic and abiotic environmental factors
Biology
Chemistry
Ecology

3.2.11. Financial incentives for farmers to conserve wetlands

Speed dating teams were posed the question, *"Should farmers be paid to conserve wetlands on their farms?"* Thirteen teams answered this question. However, one team's response has been removed from analysis as it did not directly answer the question. Of the remaining twelve teams, 100% of respondents included in the analysis answered 'Yes' to this question. An analysis of any further elaboration made on this point, indicated a relatively wide diversity of reasons as to why incentivisation was crucial. As these answers varied they have been tabulated below for ease of understanding. The thirteenth answer has been included within this table and marked with an asterisk as its content may prove useful.

While the phrasing and direct reasons provided may have differed between responding teams, a common theme generally runs between all reasons provided. This is that without financial incentivisation it is extremely difficult, and indeed unjust, to push conservation measures which could potentially be to the financial detriment of persons owning and using the land. Therefore, financial incentivisation is crucial for the overall wellbeing of both nature and people.

Table 20: Elaboration on reasons for financially subsiding conservation management by landowners and frequency of each response.

Elaboration on why Farmers Should be Financially Incentivised to Conserve Wetlands	Number of Answers Which Referenced this Point
Risk of losing single farm payment	2
Farmer's expertise required for land management	1
Farming is undertaken to make a profit	1
Prevent development of land	1
Difficult to change mindsets and behaviours without a financial incentive	1
In countries where land is limited they should be compensated for any loss of land	1
Landscapes are dependent upon farm management strategies	1
Farmers should be paid based on results	1
For SAC wetlands farmers should receive compensation to conserve these wetlands *	1*

The second part of this question asked teams, *"Should farmers be paid to sustainably use wetlands on their farms, e.g. turloughs, callows?"* In total, 83.3%, (10 teams), indicated that farmers should receive financial incentives to manage both of these wetland ecosystems when occurring within the boundaries of their farmsteads. The most common theme arising from elaborations upon this point was that these ecosystem types require sustainable management through measures such as grazing. Therefore, financial incentives would enable these habitats and associated species to survive and thrive and compensate farmers for any reduction in land area or arability.

Of those teams that did not fully endorse this measure, 8.3%, (one team), indicated that while they felt that management of callows should possibly be financially rewarded, farmers should not be financially incentivised to sustainably manage areas where turloughs occur on their farms. The reasons provided for this view were that while callows require grazing as a management style, the

best strategy for turloughs would involve education and protection of water resources rather than sustainable management by farm owners. The remaining 8.3% of respondents (one team), indicated that financial incentives should not be provided to farmers to manage such ecosystems if they occurred on their land. Instead they felt that these ecosystems should be left in a 'pristine' or natural state with no interference from farmers.

3.3. Participant's views on volunteer and community engagement

3.3.1. Perceived role of volunteers in wetland issues

Response to the question, *"Is there a role for volunteers in wetland issues?"*, was overwhelmingly positive, with 100% of participants answering 'Yes'. The principal areas of activity identified by respondents for volunteers are tabulated below;

Table 21: Potential areas for volunteer activity in wetland conservation and the associated frequency of each response.

Potential Areas of Volunteer Activity	Number of times mentioned by participants
Citizen Science	18
Education	12
Amenity Services/Community Engagement	8
Restoration	6
Public Awareness	5
Stewardship	4
Reporting illegal activity/identifying pollution	4
Political Activism	3

The main citizen science activities which respondents suggested volunteers could become involved in were biodiversity monitoring, more specifically bird and amphibian surveys. Education, which was the second most popular response to this question, principally focused on educating across all demographics. One respondent suggested engaging volunteers to create educational trails and running educational centres. Three respondents specifically referred to educating youth

about wetland conservation and associated issues. In terms of increasing public awareness, the use of social media was mentioned by one participant as a method for volunteers to raise public awareness. No further methods were elaborated upon.

Amenity and community engagement services which were recommended as potential areas for volunteer involvement focused on activities such as guided walks, providing information, constructing boardwalks for visitors and running a GPS linked photo competition for members of the public to take pictures of their idea of a wetland. It was suggested that this could inform the concept of what a wetland is and raise awareness nationally regarding wetland habitats.

Of the two respondents who elaborated on the type of activities that volunteers could undertake to restore wetland habitats, clean ups and removal of invasive species were mentioned. In terms of identifying pollution events, one participant suggested that volunteers could be engaged to find and highlight new and diffuse sources of pollution. A second participant indicated that volunteer services could be used to report illegal activities such as draining or infilling of protected wetlands.

With reference to political activism, advocacy for regulations and acting as networks to regulators were the two methods suggested for volunteers to become involved in as political activists. No elaboration was made by participants on how volunteers could engage in a wetland stewardship role.

3.3.2. Feedback on optimal methods to promote wetlands and wetland conservation in communities

During the Speed Dating for Aquatics event, participants were asked to *"name five ways to best promote wetlands and wetland conservation in communities."* All respondents listed education as an effective means of addressing this issue. Community engagement/stewardship was the second most commonly cited means of promoting wetlands and conservation, with 67% of responding teams suggesting this method. Within this category, three participating teams mentioned the necessity of providing funding for local communities to use for investment into such projects. The provision of infrastructure to ease accessibility to wetlands and the need to promote and/or raise awareness around wetland conservation was also cited in 42% of responses respectively.

Education was also the most popular response to the question *"name five ways to best promote wetland ecosystem services to communities"* with 93% of respondents listing it as a key method. Three means of providing education were discussed throughout most responses. These were; linking wetland education with the Green-Schools Programme, the creation of educational trails and centres, and using local community groups to promote wetland ecosystem services and conservation.

3.4. Participant's personal connection to wetland ecosystems

Figure 7: Participant's favourite habitats and species and some of the words and sentiments used to describe them. Some answers are paraphrased. All answers provided by participants to these questions can be viewed in Appendices 4 & 5.

One question was chosen to assess the connection which participants felt with wetland ecosystems. This was, "*What is your favourite wetland habitat and favourite species - and why?".* The answers provided were diverse, but overall marshes were the most frequently mentioned wetland habitat type.

While six of the reasons provided for the choice of habitat mentioned the presence of particular species or types of species as the basis upon which choices were made, four of the answers provided referred to the beauty of these habitats or the feeling which these ecosystem types evinced in respondents. An interesting answer was provided for one participant's choice of constructed wetlands. This was the ability to bring nature to people and create a connection with wetlands through this means.

In terms of species choice, only one species, the marsh fly, was mentioned twice. Two of the reasons provided for the choice of species were of a scientific nature. The majority of responses which provided a reason indicated a more personal attachment to the species or genus of choice, such as its aesthetic quality (see Appendix 4 and 5 for a breakdown of respondent's favourite habitats and species and the reasons provided for their choices).

4. Discussion

While the majority of respondents to the questionnaire included in the delegate's conference pack were working in Ireland, 33% were working abroad. This provided an opportunity to assess management ideas, pressures and connectedness to wetland ecosystems both on a national and international scale.

4.1. Delegate's knowledge and assessment of the Ramsar Convention

Previous surveys have been conducted to gather an overall impression of pubic and professional perceptions of wetlands (e.g., Streever et al., 1998; Kaplowitz & Kerr 2003). However, to the best knowledge of the author, no research has specifically assessed public and professional perceptions of the Ramsar Convention.

The results from this study were positive in terms of participants' overall knowledge of the Ramsar Convention and its aims. A total of 90% of respondents indicated that they were aware of the Ramsar Convention. The majority of respondents, (61%), indicated that the main aim of the Ramsar Convention is the protection of wetlands, while 35% and 30% respectively, directly cited the phrases 'wise use' and 'conservation' which are both used in the official Ramsar mission statement (Ramsar 2016). This indicates a strong general knowledge of the convention among survey participants.

With regard to a definition of wetlands, there is much debate within the scientific and ecological community regarding what constitutes a wetland (Harvey & Chrisman 1998). The Ramsar Convention's definition of wetland ecosystems incorporates a diverse array of ecosystem types. It has been noted that the definition may be too broad to allow for precise scientific research, although it is acknowledged to be one of the best frameworks available (Keddy 2000).

Consensus on the definition was split among the survey participants also. In total, 59% of respondents indicated that the definition is not too broad, compared to just 11% which indicated that it is, and 30% who suggested that it may possibly be too broad. A proportional difference in the professional backgrounds of participants may, to an extent, explain this lack of consensus. Of those delegates who indicated that the definition is or may be too broad, 64% were academics compared to 25% of those that suggested it is not too broad.

The Ramsar definition has been criticised specifically due to the difficulties such a wide definition imposes on further scientific research (Keddy 2000). Therefore, this difference in opinion could be at least partially the result of a difference between a values and scientific based approach to conserving wetlands. Indeed, the principal reason that emerged for maintaining the current definition was that all ecosystems have value and are interconnected.

By contrast, those participants which answered 'Maybe' or 'No' to maintaining such a broad definition typically emphasised the differing ecosystem functions of wetland habitats, the need to prioritise based on scale and importance, and the confusion which a broad definition may give rise to when designating wetlands at a national level. The significance of this is that it indicates the necessity of understanding the value system of an audience when addressing them on issues pertaining to wetland conservation.

4.2. Participant's input into technical issues surrounding wetland ecosystems

4.2.1. Relevance of wetlands to climate change

As global warming accelerates, the relevance of wetlands to mitigation of climate change is a growing topic of discussion. Ramsar lists the following ecosystem services that wetlands provide in terms of climate change mitigation; (i) carbon sequestration, (ii) water filtration, (iii) flooding attenuation, (iv) erosion control, and (v) protection of local communities (Ramsar 2015). In accordance with this, the three most common answers provided by respondents for the relevance of wetlands to climate change were carbon sequestration, flooding attenuation and water filtration.

4.2.2. Global and national threats to wetland ecosystems

Despite the ecosystem benefits which wetlands have been proven to provide, these habitats are declining globally (Ramsar 2017). The key threats to wetlands globally have been identified as drainage and reclamation of land for industry and agriculture, invasive species, pollution and

climate change (WWF 2017). The results of the survey will be discussed here as they relate to the key global threats identified by the WWF.

In terms of principal threats to wetlands within respondents' countries of work, drainage and reclamation of land was identified as a key threat to wetlands (76% of responses), in line with the WWF's global analysis. Similarly, the proportion of answers which referenced drainage and reclamation as a primary cause of wetland destruction on a global scale, (86%), was significantly higher than for any other category. This indicates that participants view development of wetland ecosystems as a prevalent problem both nationally and globally, irrespective of the operating forces driving it.

One interesting difference in proportional responses citing drainage and reclamation as a principal threat was found between Irish and international delegates. When referring to the principal threats to wetlands in their countries of work, 85% of participants working in Ireland indicated drainage and reclamation as a principal threat, compared to 56% of participants working abroad. This difference in proportional responses may be due to the current media and national focus surrounding peatland harvesting in Ireland. Indeed, 60% of respondents working in Ireland referenced peatlands when citing this threat, indicating that this is currently a key concern among environmentalists in Ireland.

Pollution was the second most frequently cited threat to wetlands by international delegates within their countries of work, (44% of responses). Conversely, only 15% of respondents indicated that pollution is a key threat to wetland ecosystems in Ireland. On a global scale, 23% of participants cited this threat as a primary cause of wetland decline. However, many of the categories such as agriculture, industry and urbanisation overlap with pollution, and may indirectly imply polluting effects. Therefore, this may be an underestimate of the emphasis which participants place on this threat both globally and nationally. Further research which defines risk categories and perhaps asks respondents to rate them according to their impact may elucidate this area further both at a national and global scale.

While climate change was cited in 33% of answers addressing causes of wetland decline globally, it was only referenced in 7% of respondent's answers to principal threats to wetlands in their countries of work. This is despite the fact that, for example in Ireland, climate change is considered a key threat to wetland ecosystems (EPA 2016).

There are a couple of potential reasons for this disparity. It has been found that individuals find it easier to perceive the risks of climate change at an international rather than local scale. Instead, factors which are more immediately visible are typically prioritised (Leiserowitz 2006). Therefore, this disparity could be the result of difficulties among respondents in visualising climate change on a local rather than global scale.

A second possibility is that the effects of global climate change have until recently at least, been most visible in developing countries (Wade & Jennings 2015). Therefore, an implicit bias surrounding the impact of climate change on a local versus global level may exist. This issue is important as it is difficult to change public actions without significant understanding and knowledge of the risks which climate change poses locally (Dunlap & Saad 2001).

In contrast to the WWF, which listed invasive species as a key reason for the decline of wetland habitats, no respondents listed this as a reason for global wetland decline. Within respondent's own countries of work the frequency of answers referring to invasive species was also very low, with 3% of answers, (one respondent), citing this threat. This respondent was working outside of Ireland. The reasons for the low level of respondents which listed this as a principal threat at both a national and global level are unclear.

While agriculture was referred to by the WWF in terms of drainage and reclamation, (WWF 2017), 53% of respondents indicated agriculture without any further elaboration, as a primary reason for wetland decline globally. At both a national and international level, agriculture was the second most commonly cited reason for wetland decline, although at a national level it was one of several factors to be listed in 'second place'. Despite this the percentage of answers indicating agriculture as a global threat was much higher (53%), than at a national level (24%). The reasons for this are unclear. However, agricultural intensification and land use change is accelerating at a global scale. Indeed, in many developing countries the most significant source of income is through agriculture, which necessarily requires land use change (Barbier 2004). The effects of this global acceleration upon biodiversity-rich habitats such as wetlands and forests are extremely visible, particularly in developing countries (Kenner 2014). This heightened visibility may to some extent explain the greater consciousness among participants of the impacts of agriculture at a global rather than national scale.

4.2.3. Management strategies in response to climate change

In the face of climate change, coastal retreat as a management strategy is an increasing topic of debate (Strack 2017). It is considered both economically and politically divisive, and much depends upon the financial value of the area impacted, the political leanings of the government in power and the level of trust local communities inherently place in their government (Schmidt et al., 2014). A total of 50% of respondents to a question posed during the speed dating event on the political acceptability of coastal retreat indicated that it is not considered as a solution in their region. Only 10% of respondents, one team, indicated that it is acceptable in their area and the remaining 40% were uncertain.

In terms of economic viability, consensus was once more split between participating teams. Of the 40% of respondents that indicated that it is an economically viable solution in their region, the main theme which emerged is that despite this, uptake of this strategy may fail due to short term costs in relation to actions such as rehousing individuals. While short term costs may be prohibitive and loss of property politically unpopular, organisations such as Friends of the Earth have indicated that it may be one of the few methods to save biodiversity in the face of coastal squeeze (Murray 2017). In addition to this, some have argued that in the long - term managed retreat may be the most financially justified method of coping with increased storm events (Murphy 2014). Further research into the economics of a variety of coastal management methods, and the political and public perceptions of coastal retreat is required to assess the viability of this method.

In the short - term, soft engineering solutions which reduce the impact of flooding rather than working to prevent it are considered more economically viable and allow government officials time to plan long-term strategies (Jackson 2014). The most common soft engineering methods suggested by respondents for urban areas were, Integrated Constructed Wetlands (ICWs), the use of swales, trees and reeds and Sustainable Urban Drainage Systems (SuDS). In relation to rural areas, the use of swales/trees and reeds was also commonly suggested, with the restoration of wetlands, particularly raised peat bogs the second most frequent answer provided.

4.2.4. Constructed wetlands – wastewater treatment facilities now and in the future

Constructed wetlands were put forward as a soft solution to flooding in the future. Another purpose which they serve is acting as a wastewater filtration system (Greenway 2005). Respondents were asked if this was a viable solution in the future due to the potential for overloading. Most respondents (75%), indicated that it is a potential problem in the future, but only if systems are not managed correctly. Research on this topic has indicated that in accordance with most respondents on this issue, although overloading is a potential problem, management strategies such as the use of lagoon systems, maintenance of settling pits and regular upkeep can enable constructed wetlands to operate efficiently over the long term (Hoffman et al., 2011; Miller et al., 2015). Further research and education is required on this topic to assess the long - term viability and public and government acceptance of it as a waste water treatment strategy.

4.2.5. Is an understanding of the hydrological functioning of a wetland essential to its conservation?

Understanding the hydrology of wetland ecosystems, both constructed and natural, has been an important area of research, particularly as climate change accelerates (Ferrati et al., 2005). Participants were asked if understanding a wetland's hydrology is necessary for its conservation. The majority of respondents (73%) indicated that it is essential for the conservation of such ecosystems, while 27% of respondents suggested that it is crucial in some instances. The key themes to emerge from all respondents was that understanding the hydrological functioning of a wetland is important for its restoration, management and protection. This is in in line with much current research on hydrology and the function of wetlands (e.g. Bergkamp & Orlando 1999; Erwin 2009), although climate change was only referred to in one survey answer in contrast to the emphasis placed on it within the research community.

4.2.6. Areas relating to wetlands requiring further academic research

Participants indicated the need for further ecological, political and community based academic research. The combination of political, social and ecological research for conservation efforts has been addressed as an area which urgently requires an integrated approach for conservation to succeed (Redman et al., 2004; Cinner & Aswani 2007). Studies have indicated that conservation efforts and success are dependent on wider public values, understanding, and the land

management decisions undertaken by residents in the community (Guntenspergen & Dunn 1998, Mensing et al., 1998, Kelly 2001, Kaplowitz & Kerr 2003). Furthermore, combining social and ecological research with an understanding of sectoral interests, funding availability and the structures upon which funding is based, is crucial to bridging the research – implementation gap which has at times beset academic research (Knight et al., 2008). The three main areas of ecological research which were most frequently addressed by participants were hydrology, interactions with other systems and the study of invertebrates in these ecosystems.

4.2.7. Financial incentives for landowners to conserve wetlands

EU and national funding schemes have been implemented to incentivise landowners to conserve specific habitats within designated sites. Some benefits of financial incentivisation schemes are, (i) they can create an atmosphere of cooperation and reduce conflicts of interest, (ii) can enable landowners to conserve their land beyond their legal obligations, and, (iii) they can encourage landowners to implement conservation measures they may have been reluctant to implement without financial incentivisation. Although some aspects of incentivisation schemes have come under criticism, they are generally considered a step in the right direction (Disselhof 2015). All survey participants were in favour of using financial incentives to encourage landowners to conserve wetlands. When asked specifically about financially rewarding landowners to manage callows and turloughs, 83.3% of respondents indicated they felt this was necessary.

4.3. Participant's views on volunteer and community engagement

Volunteers are considered a vital resource to the success of many conservation efforts (Guiney & Oberhauser 2009). All survey respondents similarly agreed that a role exists for volunteers within a wetland conservation context. The three key areas of potential volunteer activity identified by respondents were; citizen science, education and amenity services/community engagement.

Citizen science is considered a mainstay in much ecological research (Dickinson et al., 2010). The benefits of citizen science include increased affordability, the opportunity to gather data over wider geographical areas, and the forging of connections between volunteers, the environment and conservation efforts (Tulloch et al., 2013; O'Brien et al., 2010). The process of involving people in the research and monitoring phases of ecological study has been shown to increase understanding of environmental issues and boost public motivation for restoration projects

(Saunders 1990). Therefore, citizen science fosters a sense of connection between citizens and nature, while additionally providing much needed data on a range of ecological issues.

This connection is extremely important to the success of conservation efforts. Conservation psychologists have suggested that given the magnitude of environmental issues which we currently face, increasing public perception of the value of the environment and re-connecting people with nature is imperative (Ernst & Theimer 2011). Both education and community engagement are methods by which this may be achieved, and once more volunteer efforts are an effective means of carrying out these activities.

Promotion of wetlands to the wider public can be achieved through a variety of means. The main methods suggested by survey respondents for promoting wetlands in communities were through education, community engagement/stewardship, provision of amenities and raising awareness. These methods are effective tools for the promotion of habitats and conservation efforts to restore and maintain them. However, irrespective of the methods used, research has indicated three key principals surrounding public engagement efforts which must be borne in mind when implementing any measure.

Firstly, the participation of local communities in the conservation of habitats within their community is a key component of ensuring the success of conservation efforts (Andrade & Rhodes 2012). Secondly, in order to inspire and motivate communities to conserve their local environment, an understanding of the social values and local interests of the community is necessary (Novacek 2008). Finally, with regard to the long-term maintenance of environmental values, focusing on education of younger generations is key to future conservation efforts. Research has indicated that involving children in nature activities from a young age contributes significantly to the development of environmental awareness (Ewert et al., 2005; Wells & Lekies 2006). Therefore, involvement, understanding and engagement are all key elements of any public engagement measure, irrespective of the method employed.

4.4. Participant's Personal Connection to Wetland Ecosystems

The most striking theme to emerge from the question, *"What is your favourite wetland habitat and favourite species - and why?"*, was the subjective nature of many of the reasons provided for participant's choice of habitat and species. The implication of this is that to forge a connection and

feeling of responsibility towards wetlands in the public, people must have the opportunity to experience these habitats (Johnson & Pflugh 2008). Therefore, public involvement in, and appreciation of wetlands is key to continued conservation efforts.

5. Conclusions and Recommendations for future work

5.1 Conclusions

The work undertaken for this study provides an insight into the differing viewpoints and feelings of a group of individuals of diverse backgrounds in relation to wetlands and their conservation. The sample size for this study was small and therefore the results should be viewed solely as a 'snapshot' of views and opinions. However, the initiative to use the opportunity of a focussed group of national and international wetland professionals to seek out their views has provided the Irish Ramsar Wetlands Committee with valuable and useful information which could form the basis for further work and study.

The views shared in this study capture the value and importance of wetlands attributed by respondents, but this value goes beyond ecological structure and function and societal benefits. It is the personal connection to wetlands felt by respondents that is striking, though it is important to acknowledge that all of the individuals are working with, and have a specific interest in, wetlands. While the term 'wellbeing' was not captured in the questionnaires, the words highlighted in the 'personal connection' Word Cloud intimate that, for the respondents, wetlands contribute to their sense of wellbeing and they highly value them.

The value of wetlands, through the goods and services they provide, and the species which inhabit them may not be fully appreciated by the general public and policy decision makers in Ireland. In the past wetlands in Ireland may have been viewed by some, and may still be viewed, as not being of particular value and this can be reflected in their draining, infilling or reclamation. People will protect what they value. In order to understand the current views of the public and to inform conservation of wetlands in Ireland, the following recommendations are made. Additional

recommendations are made which seek to establish the current knowledge base on wetland structure and function and to fill gaps in the knowledge.

5.2 Recommendations

The following are suggested recommendations that the Irish Ramsar Wetlands Committee, and/or its associated partners and groups, could consider for future work and study coming out of the analysis of the survey responses and questions.

5.2.1 Recommendations relating to citizen engagement

1. Undertake a survey of the perception of wetlands among the general public and also of how people interact with wetlands in Ireland.
2. Undertake a review of citizen science activities relating to wetlands and wetland species (especially birds and amphibians) in Ireland and produce an inventory of such activities. Engage with providers of these activities and determine where there may be opportunities for supporting and expanding activities.
3. Explore options with established citizen science project coordinators in Ireland to pilot and establish wetland caretaker/stewardship programmes.
4. Engage with successful wetland education and public engagement providers and educators in Ireland and abroad, seek to establish the success factors for effective engagement activities and events. Facilitate a national workshop to promote these success factors and to promote opportunities for members of the public to enjoy wetlands.

5.2.2 Recommendations relating to research

5. Consult with relevant experts in Ireland and undertake a gap analysis of Irish research relating to wetland hydrology and ecology. Where possible, establish a framework for addressing these gaps for which funding could be sought.
6. Undertake review of published information on the conservation status of Ireland's wetlands including current pressures and threats, identify gaps in the knowledge, seek to fill the gaps and establish solutions to reduce these impacts.
7. Undertake a literature review to determine the existing knowledge, and identifying any knowledge gaps, of the potential impact of climate change on wetland ecosystems and wetland habitats and species in Ireland. This could explore the opportunities that well-functioning ecosystems can provide in terms of adaptation to climate change impacts (e.g. carbon sequestration, water attenuation for flood control). From this review, prioritise the research that needs to be undertaken to fill these gaps and seek funding for future research.
8. Develop a programme of awareness raising on the outcomes of the research reviews in non-technical language with the general public, government and the media.

5.2.3 Recommendations in relation to this report

9. Produce a short and visually appealing summary/information sheet of the findings of this report for the general public (bearing in mind the limited scope of the surveys, sample size, etc.).
10. In terms of future research work using questionnaires, use of a mixture of both closed and open - ended questions would be more effective. In terms of closed questions, the use of scales would provide greater consistency in respondents' answers. This would enable a

more comparative analysis and greater precision in identifying themes. Open ended questions could then be used to facilitate elaboration upon these points when necessary.

Acknowledgements

We would like to thank the Irish Ramsar Wetlands Committee (IRWC) for access to survey material for this report and, in particular, IRWC members: James King, Ciara Maxwell, Niamh Fitzgerald and Paul Johnston for their generous contributions to this report. We hope that this technical analysis will be of benefit to the Committee in its mission to promote wetland conservation and the wise use of wetlands into the future. Special thanks also to Tadhg O'Mahony and the Environmental Protection Agency for commissioning and funding this study.

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Appendices

Appendix 1: "International Conference on Natural and Constructed Wetlands" Flyer

Inaugural International Conference on Natural and Constructed Wetlands

Interactions between Scientists and Engineers

Galway, Ireland, 21—22 June, 2016

The Inaugural International Conference on Natural and Constructed Wetlands (NCW) will be held in Galway, Ireland, on 21—22 June, 2016. NCW 2016 will focus on the performance of natural and constructed wetlands, taking the perspectives of ecologists and engineers into account.

Who should attend?

We welcome attendance from wetland scientists, ecologists, engineers, environmental managers, heritage officers, planning officers, policy makers, undergraduate and postgraduate students.

Confirmed Keynote Speakers include:

Prof Jan Vymazal (Czech University of Life Sciences, Prague)
Prof Matthijs Schouten (Wageningen University, The Netherlands)

Conference themes:

Wetlands in watershed management and flood control, ecological and environmental management, experimental modelling, wetlands for water pollution control, environmental and economic assessments, new developments in wetland design, wetland ecology and conservation, wetlands and climate change.

Key Deadlines:

Abstract submission	19 February 2016
Notification of acceptance	10 March 2016
Early bird registration	30 March 2016

epa — **Further Information and Registration: www.conference.ie** — Ryan Institute — Engineers Ireland

Appendix 2: Example of questionnaire included in delegate conference pack

Irish Ramsar
Wetlands Committee

2016 - Inaugural International Conference on Natural and Constructed Wetlands, June 21-22

NUI Galway
OÉ Gaillimh

IRWC Questionnaire for Delegates

The Irish Ramsar Wetland Committee (IRWC) was established by the Irish government in 2010 in order to promote the aims of the Ramsar Convention on Wetlands. The IRWC acknowledges the support of the Conference Organising Committee for allowing us to have this Questionnaire included in your pack.

We ask you to please fill it in and return to our desk in the concourse area before you leave.

*You are also invited to our "**Speed-Dating for wetland persons**" event on **Tuesday at 16.00** (see programme)*

Questions

- Country where you work:
  USA - Ohio
- Your role: academic/public authority/consultant/NGO/other?
  Volunteer
- Do you know about the Ramsar Convention? heard about it but do not know much
- If 'YES' what decade was it convened in? What is its main aim?
  very recent past
  important do wetlands in Ohio - evaluation of wetland quality
- Is there a Ramsar Committee in your country? yes
- Is it active? yes
- Are there any special measures for wetlands conservation in your country/region?
  yes. Some do actually provide protection of wetlands when properly enforced. This does not often happen. Also - some things like mitigation, allow developers to destroy natural wetlands + pay to have an artificial wetland built
- Suggest 3 KEY reasons for wetland decline in the world?
  (1) development $$$
  (2) ignorance - public sees wetlands as nasty mosquito-breeding swamps that should be drained + sprayed.
  (3) human over population
- What are the 3 KEY wetlands issues in your country?
  (1) development of natural wetlands
  (2) drainage to "improve" land + reduce mosquito populations (which it does not)
  (3) pollution + invasive species causing loss of diversity in wetlands
- The Ramsar Convention embraces ALL TYPES of wetlands: is the classification too broad? Give reasons.
  All wetlands are important. Water is life & water travels through many different types of wetlands and should be protected within all of them. However, we should be careful not to get too far overextended - it might be good do work with other groups do protect specific wet areas such as seashore, etc.

...PTO

- Should rivers, lakes and estuaries be classified as wetlands? Give reasons.

All of these areas need + deserve protection. Water travels from one to another and should be protected regardless of how it is at the time.

- Is the Ramsar Convention relevant for Europe – with the WFD and Habitats Directive in place?

I believe so.

- Is there a role for volunteers in wetlands issues? Yes
- If yes, can you suggest three areas of activity?

1. education
2. Political activism
3. citizen science participation and similar projects

- How are wetlands relevant to climate change? – give 3 headings/points

1. wetlands are a good carbon storage area
2. water purification
3. climate - ~~weather~~ stabilization aspects, surge (floodwater) absorption

- Is there a role for volunteers here?

Oh yes, we need an army of volunteers.

- Any further comments:

2 very important things:

(1) LAW. Many laws currently on the books support or require destruction of wetlands. This needs to change.

(2) Public support needs to be cultivated – many prejudices ~~exist~~ about wetlands. This also needs to change.

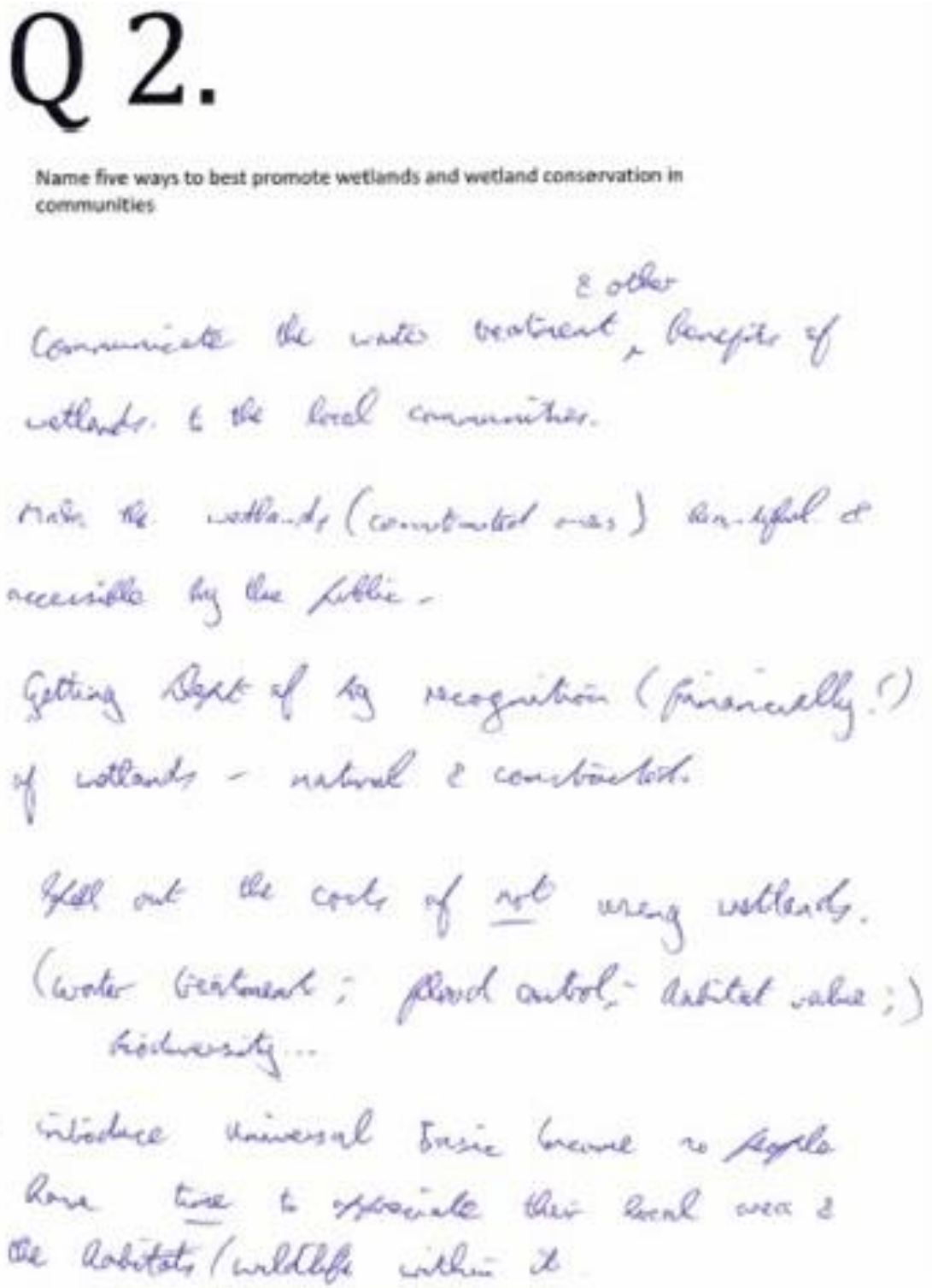
Thank you! ....and thank you to the NUI Galway Conference Committee for facilitating the IRWC

Sorry - most was written in dark without my glasses – hope you can make some sense of it!

Thank you for all you do!

Appendix 3: *Example of question included in 'Speed Dating for Aquatics' Event:*

Irish Ramsar Wetlands Committee "Speed Dating for Aquatics" at
International Conference on Natural and Constructed Wetlands, Galway 21-22 June 2016



Q 2.

Name five ways to best promote wetlands and wetland conservation in communities

- Communicate the water treatment & other benefits of wetlands & the local communities.
- Make the wetlands (constructed ones) beautiful & accessible by the public.
- Getting Rid of bg recognition (financially!) of wetlands - natural & constructed.
- Spell out the costs of not using wetlands. (water treatment; flood control; habitat value; biodiversity...
- Introduce universal basic income so people have time to appreciate their local area & the habitats/wildlife within it

Appendix 4: Respondent's favourite species and the reasons provided

Species	Number of Times Mentioned by Respondents	Reasons
Marsh fly	2	(1) No reason provided (2) No reason provided
Sphagnum mosses	1	Very rare and adapted to special conditions
Zooplankton	1	No reason provided
Carex species	1	Diversity within the genus and the associated micro – bioindicators
Little egret	1	Aesthetic quality
Fairy shrimp	1	No reason provided
Bog Pimpernel	1	Enjoys searching for them
Grass of Parnassus	1	Associations with Greek mythology
Hare	1	Aesthetic quality
Bog cotton	1	Aesthetic quality
Meadowsweet	1	No reason provided
Purple loosestrife	1	No reason provided
Curlew	1	No reason provided
Eels	1	No reason provided
Trout	1	No reason provided
Common fern	1	Sells them
Slender naiad	1	No reason provided
Marsh marigold	1	No reason provided
Sepedon sphega	1	Aesthetic quality
Caltha palustris	1	Cheerful plant
Water mint	1	Beautiful smell
Phragmites	1	No reason provided

Appendix 5: Respondent's favourite habitats and the reasons provided

Habitat	Number of Times Mentioned	Reasons
Marshes	4	(1) None provided (2) None provided (3) Species rich (4) Al – Hammar Marsh [Iraq]
Raised bogs	2	(1) Very rare (2) Enjoy searching for bog pimpernel
Blanket bogs	2	(1) Sense of wilderness they provide (2) Pristine landscape
Turloughs	2	(1) None provided (2) Magical ecosystems
Lakes	2	(1) Lough Neagh (2) Sight of dappled light shining through the water
Maleleuca wetlands	1	Great trees, great habitats for birds/bats.
Upper estuaries	1	Combines brackish habitats and coastlines
Fens	1	The mixture of mosses and sedges
Tall Herb Fens	1	None provided
Vernal pools	1	Change with the seasons
Wet meadows	1	None provided
Intertidal mudflats	1	Presence of samphire, burrowing crustacea, bivalves
Cajas National Park	1	None provided
Coastal wetlands	1	None provided
Oligotrophic lakes	1	None provided
Constructed wetlands	1	Can develop wetland habitat in close proximity to people. Helps develop appreciation of nature in people who may not have access to it otherwise.