Wales Land Management Forum (WLMF) Sub Group on Agricultural Pollution

Minutes

Title of meeting:

Wales Land Management Forum (WLMF) Sub Group on Agricultural Pollution

Location: Microsoft Teams Meeting

Date of Meeting: 27th March 2023

Present:

Zoe Henderson, Chair and NRW Board Member
Rhys A. Jones, NRW Board Member
Dav Letellier, NRW
Dennis Matheson, TFA
Shane Thomas, Carmarthen Fishermen's Federation
Andrew Chambers, Welsh Government
Sarah Jones, Dwr Cymru Welsh Water
Fraser McAuley, CLA
Nichola Salter, NRW
Bernard Griffiths, FUW
Marc Williams, NRW
David Ball, AHDB
Russ Thomas, HCC

Additional Attendees Present:

John Williams, ADAS (Item 5)
Professor Chris Collins, NRW (Item 6)
Dr Liz Bagshaw, Cardiff University (Item 6)
Jon Harrington, Cardiff University
Arwel Williams, Welsh Government

Secretariat:

Bronwen Martin, NRW

Apologies:

Creighton Harvey, Carmarthen Fishermen's Federation

Mathew Walters, Welsh Government

Rachel Lewis-Davies, NFU Cymru

Liz Franks, Hafren Dyfrdwy

Einir Williams, Farming Connect

Kate Snow, United Utilities

Rachael Madeley Davies, HCC

Ieuan Stephen Davies, NRW

Sarah Hetherington, NRW

Item 1 Introductions, Apologies and Declaration of Interest

1. Zoe Henderson (NRW Board Member and WLMF Sub Group Chair) welcomed all to the Microsoft Teams meeting and noted apologies. Zoe welcomed Rhys A. Jones who is a new NRW Board Member and will be chairing the WLMF and the WLMF Sub Group from May 2023 onwards. Zoe mentioned a suggestion where the WLMF Sub Group meetings could include a 'rotating Chairperson' and asked members to think about this possibility. Rhys briefly introduced himself.

2. The meeting is being recorded for the purpose of capturing the minutes and the digital file will be deleted once the meeting minutes have been approved.

3. No declarations of interest were raised in respect of agenda items.

    - NB: All members of the group have completed declaration of interest forms already but should also declare if they have an interest in anything on the agenda.

Item 2 Review of Minutes and actions

4. Zoe confirmed that once the meeting minutes have been reviewed and formally agreed by the group, they will be published on the NRW website for the public to access. Therefore, it is important that the minutes are an accurate record of the meetings.

5. The group reviewed the previous meeting minutes from 20th February 2023. No comments or suggested amendments were received in respect of the February meeting minutes.

6. Bronwen Martin shared the actions log and reviewed the outstanding actions. A WLMF Sub Group Update Paper was circulated prior to the meeting which contained follow up information including responses to actions relating to the Dairy Project, Substantiated Agricultural Pollution Data, NRW Area Statement Review and NRW Corporate Plan.

7. Bronwen said that she met with Zoe, Marc and Chris to discuss ways of moving the group forward. They decided it would be good to link the agenda items to the group's

objectives going forward. The agenda for today's meeting included a brief background to each item as well as how they are connected to the WLMF Sub Group objectives.

8. Andrew Chambers, Welsh Government provided a brief verbal update regarding the current/future slurry investment grant windows. Andrew said his colleague Kevin Taylor has provided some information – 364 full applications were selected and around 301 were accepted. Of those, 236 submitted full applications and to date, 40 contracts have been offered and 20 of those have been accepted and RDP are still working through those appraisals. In terms of any future grants, there's nothing to report at the moment, but Andrew said he could keep the group updated. The grant window is now closed, and no more applications or expressions of interest are to be considered. It is a Nutrient Management investment scheme for a range of interventions to address nutrient management issues including slurry storage. It had a total allocation of £15 million but in terms of the applications received, it is not a full spend. Andrew did not have any information on future windows.

   Fraser McAuley, CLA said if the spend has not been fulfilled or not enough people are applying for it to use the whole allocation, then perhaps we are doing something wrong for example not sharing it wide enough with farmers. Fraser suggested this is something to think about and perhaps we need to do more to encourage applications.

   Bernard Griffiths, FUW said some FUW members have encountered a problem relating to the conflict with the Sustainable Drainage Scheme (SuDS) Regulations and the Control of Agricultural Pollution Regulations. When they're applying for planning permission, Local Authorities are wrongly saying they need to go through the SuDS Regulations. That is incurring extra costs and delays and is probably impacting on the number of people applying for grants. FUW had some feedback from members in low intensive areas like Meirionnydd where they are having difficulty in getting through planning in time to meet the regulations and getting hold of builders. FUW have spoken about this in the past and it needs addressing otherwise farmers will not be able to comply with the new regulations.

   Zoe suggested that Andrew could pass on these comments to his colleague Kevin so that he is aware of the situation regrading timescales and difficulties. Andrew said Kevin is aware of the issues and Welsh Government are also discussing this with Water Policy, who have the policy lead for SuDS.

Item 3 Matters Arising

9. The group was encouraged to discuss any matters arising from the previous meeting minutes, relevant documents, or recent topics.

10. Zoe said the meeting with Chris Mills, Bronwen and Marc was very useful. Zoe wanted to get everyone thinking about the group's objectives and said we have some wonderful presentations, but it is good to clearly highlight the link to the objectives of the group. Perhaps having a 'rotating Chairperson' can help others take a lead on topic areas that are of specific interest to those individuals.

11. Zoe recalled reading an article in the Furrow magazine about technology used in Europe which uses infrared to identify how much N, P and K is in the slurry that is being applied. We've talked in the past about the National Association of Agricultural

Contractors (NAAC), but we haven't made any progress on influencing the training and certification of slurry applications by contractors. Perhaps this could be raised and pushed forward because innovation is a key part of moving towards our goal.

12. Zoe mentioned the Substantiated Agricultural Pollution Data included in the WLMF Sub Group Update Paper. Marc Williams, NRW said he updated the graph, and it is promising that the trend is decreasing. However, we have to be mindful that this what has been reported and confirmed in NRW rather than what could be the true picture on the ground. The weather we have experienced (e.g., drier weather last year) could also have contributed to less incidents, so all the other factors should be considered. It is promising and the good work of this group of sending messages out to farmers is helping as well.

    Bernard said the figures are very welcome and accepted Marc's point that they are only reported incidents. However, looking at the trend, that was also the case in 2018 so the trend seems genuine. You could probably argue that with all the attention that agricultural pollution has had since this group was set up, that maybe there has been more reporting in recent years than at the beginning. David Ball agreed with the comments but said there is still a long way to go.

    Dennis Matheson, TFA said it concerns him how few people are actually aware of the new regulations. This is very surprising because NRW, Farming Connect and Welsh Government along with others have been publishing information, but yet there are a lot of people who don't even know about them. Zoe said that is a very important point and reflected on the update from the last meeting regarding the Service Level Agreement between NRW and Welsh Government, which includes NRW staff recruitment for these Regulations. Zoe said they will be permanent full-time jobs not Fixed Term Appointments which is really important. Dav Letellier, NRW agreed because NRW can attract the right type of people for these positions, can offer succession planning and ensure better service over time. It was agreed that by working together, we can further reduce the trend of pollution incidents in Wales.

13. Zoe mentioned the Minister's Phosphate Summit meeting where innovation was raised. There is an Action Plan for the Phosphate Summit which people have signed up to - Relieving pressures on Special Areas of Conservation (SAC) river catchments to support delivery of affordable housing: action plan.

    David Ball said the successes that we may have had regarding the number of incidents is good news but there is still the problem of diffuse pollution, which is ongoing. The phosphates issues are in areas where diffuse pollution is happening all the time, so this is an area not to be forgotten. Zoe agreed and suggested the group could look more at diffuse pollution and try to understand it better.

    Dennis recalled that at the Phosphate Summit, it seemed as though there were few agricultural industry representatives there. Dennis questioned whether the Summit organisers were aware of the enormous amount of work that this group has done on phosphates and whether there is enough integration and sharing of knowledge. Zoe said this was raised at the last meeting, particularly the concern of the various groups and making sure that things are not duplicated.

Regarding David's point about diffuse pollution, Dav asked whether it is clear on what was being done elsewhere on diffuse pollution (e.g., solutions, methods etc.) and suggested conducting a literature review. Dav mentioned from personal experience, when he has visited farms in France many of them are low or no till farms with greatly reduced nutrient loss and diffuse pollution – things are being done successfully with good results for farm viability, environmental gains, and sustainability. Dav asked if this available evidence has been collated.

AP March 01: Dav Letellier to look into consolidating evidence and information about techniques to reduce diffuse pollution.

14. No other matters arising were raised by the group.

Item 4 Small Business Research Initiative (SBRI)

15. Bronwen Martin, NRW provided an overview and update on the Small Business Research Initiative (SBRI) process. Exploring the SBRI opportunity links to the WLMF Sub Group's objectives, particularly 'develop and deliver innovative projects to help reduce agricultural pollution incidents in Wales'.

16. SBRI is about connecting public sector challenges with innovative ideas from industry, enabling organisations to utilise emerging technology and new solutions to tackle societal problems whilst supporting businesses to develop and grow. According to Business Wales - SBRI, SBRI enables the public sector to engage with industry during the early stages of development in order to design bespoke solutions, whilst enabling businesses to research new opportunities through fully funded research and development contracts. New ideas can be explored through a phased development programme that will minimise the risk for both parties and help identify the most promising projects.

17. Some members might recall that back in 2019, Gareth Browning, Welsh Government provided a presentation about SBRI at a meeting in Bangor (WLMF Sub Group Meeting - July 2019). Gareth gave an overview of the process and provided some examples of successful SBRI projects. There are further examples of successful challenges on the Business Wales website – Business Wales - SBRI. Following Gareth's presentation, members were encouraged to identify a range of concerns relating to agricultural pollution, which could then be put forward as potential SBRI challenges. Gareth also advised that the main challenges should remain broad in order for potential organisations to suggest and develop innovative solutions.

18. The SBRI process is split into two phases. Phase 1 is a technical feasibility study. The challenge will be advertised on 'SelltoWales' website and during this period there would be a briefing session which is held to showcase the challenge. After the application window deadline has closed, the panel made-up of lead organisations and partners (for example, Aber Innovation and WLMF Sub Group members) will meet to select the successful applications for interview and then choose businesses to deliver the phase one. Phase 1 proposals should concentrate on providing scientific, technical, and commercial feasibility of proposed projects. The results of Phase 1 then determine whether the solution could go forward to Phase 2, although not all projects will progress to the second phase. Typically, phase one lasts for about three to six months, with contracts worth £10,000 up to £50,000.

19. There is the potential that the project will proceed to Phase 2, which is the prototype development and evaluation, but that will obviously depend on the outcomes from Phase 1. Prototype demonstration is also undertaken in Phase 2. Phase 2 will typically last from 12 to 24 months with contracts worth £250,000 up to £1,000,000. The potential sources of funding for this challenge would need to be explored for Phase 2 and that would include in kind contributions from members of this group (e.g., resources or funding).

20. Regarding the WLMF Sub Group SBRI challenge, an Expression of Interest (EOI) was submitted and accepted, and the title is ‘how might we enable farmers to apply organic and manufactured fertilisers in a way that supports farm production without causing pollution and environmental damage and using nutrients more efficiently’.

21. Follow in a meeting with Welsh Government, Aber Innovation, and Innovative Strategy late last year, we discussed splitting the challenge into 3 sections which would help target the areas that we need to explore and help deliver our specific ask. Otherwise, the challenge could potentially be too broad and then it wouldn't deliver on the desired outcomes.

22. Regarding next steps, we need to finalise the proposed challenge (including the three separate parts), complete and submit the full application form and establish whether any members would be willing to sit on the selection panel when it gets to that stage and also identify who is willing to support the SBRI project (e.g., explore sources of funding for Phase 2, in kind contributions of time and resource).

23. Zoe said this is good progress. Initially, we want people to help with filling in the application form and volunteering to be on the panel that will assess the applications. The project proposals received is contingent on progressing to Phase 2, which is when we will need to establish sources of funding.

24. Bronwen acknowledged that people will probably need to discuss this with their organisations, but we are hoping to submit the application form as soon as possible so that it can progress within the next financial year 2023/2024.

25. Bernard asked Rhys if this is something that the innovation group in Aberystwyth University could lead. Rhys said it would be interesting to have a conversation and is something to follow up. Marc said we have met with Aber Innovation but because they've previously taken forward an SBRI project they can't really lead it, but they can support us. We are currently having discussions within NRW to explore how it can be funded and resourced for somebody to lead the project.

26. Russ Thomas, HCC said he would be keen to sit on the panel but would need to refer back to HCC before confirming. However, there may be a possibility that he might be involved in actually working up a potential project to submit and clearly there would be a conflict of interest. Zoe said it would be brilliant for Russ to be on the panel and conflicts of interest can be managed as we go forward.

27. Dav said obviously it's difficult for members to make a commitment now. So perhaps people can think about it, and we can organise a brief MS Teams call for anybody who is interested in discussing this further, to ask questions and get more information. All

the members should be invited and those who want to take part or are interested should accept and attend and those who are not should decline.

AP March 02: Bronwen Martin, NRW to arrange a brief MS Teams Call with the members to discuss the SBRI opportunity.

28. Sarah Jones, DCWW said Welsh Water would likely be interested in this and asked if a Briefing Note could be provided which could be shared with colleagues. Sarah said she is in the Drinking Water Catchment Team, but there might be other parts of the business that are interested in it.

AP March 03: Bronwen Martin, NRW to provide a Briefing Note on the SBRI opportunity which can be circulated to the members and their organisations ahead of the SBRI meeting.

AP March 04: Bronwen Martin, NRW to circulate the draft SBRI application form and a copy of the presentation.

29. Regarding exploring the funding, Marc said this is for Phase 2 and it doesn't have to come from any of the organisations on this group; it can come from external sources. Aber Innovation have used funding from BT for some of their projects. However, with our application form, we need to include how much it would roughly cost and note if we have potential sources of funding, even if we're not going to pursue it after the Phase 1 stage. Marc confirmed that Welsh Government can provide 100% funding for the Phase 1 and that's £20K up to £50K. We can put forward three applicants at £20K each. Welsh Government cannot fund all of Phase 2, it would be around 40% Welsh Government but then we need to locate the remaining 60%.

30. Bernard said one of the main beneficiaries of all this building developers so perhaps they could be potential funders of this opportunity.

Item 5 Presentation: Nutrient Loading Project

31. John Williams, ADAS joined the meeting to provide a presentation regarding the Nutrient Loading Project:

    - Work Package 1: Constraints to nutrient recovery and recycling to agricultural land in Wales

    - Work Package 2: An assessment of the current landbank in Wales

32. John provided a brief background. An estimated 10 million tonnes of organic materials are applied to agricultural land in Wales. There is around 1.4 million ha of agricultural land (excluding woodland, ‘other land’ and rough grazing). Physical and regulatory constraints limit the landbank available for manure applications. There is an increasing need to understand the impact of nutrient loading on diffuse pollution. This project carried out a modelling exercise using the ALOWANCE software tool to assess the landbank available for organic materials in Wales.

33. ALOWANCE is a GIS based software tool (Nicholson et al., 2012) initially funded by Defra. Spatial data as series of map layers (agricultural land area/use, livestock numbers etc). The landbank is calculated for 10 x 10 km grid squares based on:
    - Physical restrictions (e.g., slope, proximity to watercourses)
    - Land use (Arable, Grass, Legumes, ready to eat,
    - Regulations (Water Resources Regulations, Sludge Use in Agriculture, Safe Sludge matrix, land designations Glastir SSSI, RAMSAR etc., Scheduled monuments)
34. John showed some of the landbank mapping outputs generated during the modelling exercise including before and after restrictions, distribution of arable land, distribution of grassland etc. John also outlined the various data sources used for the project and provided visuals of example datasets.

35. John gave an overview of the restrictions used in the modelling (e.g., legislative application loading limits, designated land and protected areas, soil metal limits etc.). John then provided some figures for the landbank available based on different scenarios and gave a summary of some of the conclusions from this work.

AP March 05: Bronwen Martin, NRW to circulate a copy of John Williams, ADAS presentation on the Nutrient Loading Project along with his contact details.

36. Rhys asked if the findings and patterns would be different if it was at higher resolution rather than the 10 x 10 km grid squares and does there need to be a new version of ALOWANCE in order to do it in a more sophisticated way. John explained why he did not think it would help by going down to that level of granularity because you'll likely end up with the same message.

37. Bernard Griffiths, FUW raised concerns about the accuracy of the 10 x 10 km grid squares and asked about the granularity for habitat types across Wales. John said it is pretty good because to some extent that is often covered because land use is governed by the topography. For example, if you have a steeply sloping field, you're not going be able to apply manures and then that possibly means that it's not as managed as it was before but you'd able to have sheep grazing on it. That is covered as part of the calculations because of the livestock manure N loading limits. When initially developing the tool, there were concerns about farm businesses being identifiable based on location and map scale.

38. David Ball, AHDB discussed one of the slides regarding the land requirement for various non-agricultural organic materials like digestate, biosolids and compost. John Williams clarified that those materials account for about 18,000 hectares. David asked if there would be an element of the digestate that is non-PAS 110. John said yes, but relatively it's not very much at all. To some extent it might be an overestimate of what goes to land because when you apply for a permit then you apply for a maximum amount. David said it would appear then that the modelling suggests that there is sufficient land available for all these organic materials, but it is just a matter of distribution. John said yes, that's correct.

39. Bernard recalled that before John joined the meeting there was a discussion about the Phosphate Summit. There was a figure that John shared regarding the amount of land in Wales at phosphate Index 3 or above which was 126,000 hectares. Bernard

explained when that is expressed as a percentage of the agricultural land, it's about 7% but when it is expressed as a percentage of the available ‘spreadable area’, it turns out to be around 9%. Bernard said in terms of diffuse pollution, agriculture has got a role to play in the summit but asked if those figures suggest it isn't that big of a role and does it also suggest that any measures taken should definitely be targeted. John said from a diffuse pollution perspective, most of the phosphorus gets into water from run off and erosion and discussed some of the potential measures to prevent this. John explained that phosphate chemistry in soil is complicated because the availability of phosphate in the soil water depends on a whole host of factors, not least the texture, the source of the phosphate etc. When the soils are saturated with P then that's when the leeching component becomes an issue. RB209 says that there's no response to P from phosphate applications at Index 3 and RB209 is a fertiliser recommendation system. Therefore, if you're spending a fortune on triple superphosphate, and putting it on an Index 3 you're not going to get a response. If you have got organic materials, then you're not only supplying phosphate, but you're also applying nitrogen, sulphur, potash etc. and organic matter, as well. John said this is about a risk matrix and suggested that Index 3 is probably low in terms of the risk to phosphate leeching based on the data he has looked at.

Bernard said to clarify, in terms of land use and fertiliser applications, we should be targeting the areas of 126,000 or less if we ignore Index 3. John said yes, that is where you should be putting the muck but if we're putting materials to land, we're always going to get some run off somewhere, but we must minimise that risk and nutrient management planning is absolutely crucial to that. The national data that's available for phosphorus is good but it's not as comprehensive as we'd like. We also recognise that caveat about how the field has been used and how the fields have been managed.

40. Sarah Hetherington, NRW said the driver for this work was to see whether doing things better would actually achieve the goals or whether we need to think more about what we are doing with our materials to land. What has come out of it is that there is a major spatial context for this. There are quite a lot of assumptions in the work around data, the complexities around phosphate and also around total and available phosphate in terms of crop growth. The current recommendations are actually around maximising crop growth for the minimum money and not necessarily around the environment and the level of pollution or impact. This work has given us food for thought regarding the key issues and challenges. The SBRI opportunity is where innovation could come in because materials to land and the circular economy is important to meet Net Zero – so how do we facilitate that. It's around how we use them and reduce the impact on water, air, the environment and also protecting our soil resource.

41. John said if members have any queries, they are welcome to contact him directly.

Item 6 Presentation: Citizen Science

42. Professor Chris Collins, NRW and Dr Liz Bagshaw, Cardiff University joined the meeting to provide a background to Citizen Science and a presentation on a recent project.

43. Professor Chris Collins is the Head of Knowledge and Evidence within NRW. Chris gave a brief overview and update on what NRW is doing regarding citizen science. Chris mentioned the Prosoil+ Project which is relevant to farmers and land managers.

NRW want to see how we can help roll this project out to more farmers. This work feeds in to the evidence need outlined by NRW: State of Natural Resources Report (SoNaRR) for Wales 2020 – how can we improve the sustainable use of soils?

44. Chris mentioned the Earthtrack Citizen Science Initiative Earthtrack (aber.co.uk). NRW are exploring possible training for farmers to use Earthtrack. Data is collected via an app and then it is used to ground truth Earth observations (e.g., satellite data). This also links with the Living Wales Programme, where the data contributes to national statistics. Chris said it would be really useful if farmers could take photos of riverbanks where tree canopy actually obscures the satellite information.

45. Citizen science is used in the biodiversity area to validate things like SSSIs. NRW are working with the National Biodiversity Network (NBN) Atlas. The NBN Atlas is the UK's largest collection of publicly available biodiversity data. There are various recording apps, and this also contributes to a national database. Alongside the citizen science data, it might help us understand what's going on in catchments as we move towards possibly a more catchment approach to management.

46. One of the really good new initiatives is the Rivers Trust: Catchment Systems Thinking Cooperative (CaSTCo). NRW are working with the CaSTCo project in the development of their methodology, data platforms and analysis to ensure their data is useful. There are six rivers across the UK that are being monitored with citizen science at their core. It is run by the Rivers Trust and a lot of water companies are also involved. They are trying to find an agreed framework approach of how people can monitor the rivers and wider catchments. But implicit within that is the training of citizen scientists and local communities to carry out some of the monitoring. This is looking at how we can complement the more high-tech monitoring that's being done by NRW and the water companies.

47. Chris summarised some of the actions that NRW have committed to including revising our citizen science position statement, publish advice to support the generation of citizen science data which can meet our evidence needs, consider citizen science data alongside our own data as part of Water Framework Directive investigations, continue work analysing existing citizen science water quality data sets, provide clarification on any limitations on NRW use of citizen science data and begin developing a list of standard schemes which generate data NRW can use.

48. Liz Bagshaw is a Biochemist at Cardiff University, and from 17th of April Liz will be moving to the University of Bristol. Liz wanted to discuss some of the work that Cardiff University has been facilitating to enable citizen scientists to monitor water quality in their catchments. Water quality is not an absolute term, it's subjective term and Liz explained that when she mentions water quality it is the chemical status, but it could also be the biological status or even the radiological status. It's very important when we're thinking about water quality data that we think about the questions that we're asking of that data.

49. If we think about statutory monitoring of water quality (this presentation is regarding the perspective from the Wye catchment), it's done by agencies and it's responsible for compliance with various directives – this was previously governed by the Water Framework Directives. Generally, these data are high quality and trustworthy and they can be used for legal processes since they're using accredited methods and

laboratories. With citizen science data, we're not necessarily dealing with the same type of data. However, the problem with statutory monitoring data is its logistically difficult and expensive. Additionally, our spatial and temporal coverage is often limited for high-quality statutory monitoring data.

50. Most agencies don't have the resources to monitor tributaries to understand what's going on and see how things are changing over time. This is where citizen science comes in. If we can upskill citizen scientists to collect data that can help us, then we can fill in the gaps in our monitoring programmes. This also helps raise awareness and enables people to share in the responsibility of looking after river catchments. One of the biggest things about citizen science in the Wye, is not just filling in those temporal gaps, but filling in the spatial gaps and identifying problem areas.

51. What citizen science cannot do is aid in statutory monitoring because it is not accredited data. We can't get the same quality, so you can't use the citizen science data to identify perceived failures of SAC targets, you can't use them to calculate annual limits of loading for a catchment and you also can't use them to look at different nutrient fractions. However, we can use them to find out about what's going on in the catchment. Citizen science data has traditionally been viewed as untrustworthy, either because people don't understand the accuracy of those data, or accessing it is difficult.

52. Liz said in this project, they tried to increase the value of the citizen science data being collected and find a way to make sure it was collected a standard way that was easy to access. We had some funding from Natural Environment Research Council (six months of funding in January 2021) to try and understand the precision and accuracy of some of the citizen science methods that are being used at the moment in the Wye. Liz discussed what can be measured with the equipment that they were exploring, such as measuring electrical conductivity, temperature, pH, dissolved oxygen, nutrients, and volume of water in the river. Liz gave an overview of some of the methods that were used.

53. A number of online network meetings were held, and they wanted to share the resources between the different groups and create resources that can be shared time and time again to help those who want to set up their own citizen science monitoring programmes. They produced fact sheets, training videos and helped citizen scientists to establish an online database where they could upload data. Importantly, with the collaborative monitoring network, it wasn't just Cardiff University and citizen scientists, there were representatives from agencies like the Rivers Trust, Wye and Usk Foundation, Environment Agency, and Natural Resources Wales. There's no point in citizen scientists collecting those data if no one is going to look at it.

54. The role of Cardiff University was to support the discussion between these groups and help the interaction between the data users and the people on the ground. They also helped those who need the data and use it in a way that's appropriate. Cardiff University were not doing much data analysis, they were there to develop the methods and provide resources.

55. Alongside the citizen science data, we also installed a number of high frequency monitoring devices in the catchment. We used devices which measure water quality parameters in high resolution and in real time. They were installed in three locations in the catchment to provide context to the citizen science data.

56. The key research questions for the project were to use different citizen science methods and compare them to professional standards of water quality analysis. It was to increase trust in data collected by citizen scientists and then to use the data to look at key spatial and temporal patterns and enable others to do the same across the Wye catchment. The first thing we focused on was how good the citizen science methods were and compared them to our laboratory standards. We used an accredited Welsh Water lab. The purpose of this was to try and have a side-by-side comparison of all the different citizen science methods with the accredited standard so we could get an idea of the errors of the citizen science methods.

57. The Wye project has come to an end, but the Wye citizen scientists are continuing to collect data. The scheme that we have set up means that other groups can use the same training methods without much input from us, for example a group on the Usk have just started up and have nearly 400 measurements.

58. Cardiff University are exploring ways of having a user portal where you can click on anywhere in the country and see what citizen science data is available. Hopefully this is something that we can work towards with the CaSTCo project going forward.

59. Rhys said it seems like this was about getting individual people involved with collecting the data rather than analysing it, so how do you enrol people to analyse it. There is a new curriculum in Wales emphasising the theme of rivers and biodiversity, is there any potential to enrol school children into this. Liz mentioned the Countryfile episode from last Sunday which showed citizen scientists taking school children out to collect data. Getting children out can help them have an awareness of the issues in a catchment and builds on the education process. Regarding data analysis, Liz said they found that many of the citizen scientists they work with said they were happy to collect the data, but they didn't feel qualified to analyse the data themselves.

60. Bernard said that data should be used in an appropriate way and some FUW members have received death threats from activists. Bernard asked how you reconcile the sharing of the data and the transparency that's required but also protect people and control the situation. Liz said this is a really important point and it was something that the volunteers were also quite hesitant about (e.g., data availability and the need to anonymise data and who is collecting the data). It’s getting a compromise between data being made available and being able to identify individuals collecting the data which is a really difficult balance. Particularly in these catchments, there is often conflict and the data can be inappropriately weaponised. Liz suggested working with the citizen scientists to design the monitoring programme and have the science questions foremost in your mind before ging out and collecting the data. Liz reminded the group of the inappropriate locations to collect data along a river (e.g., measurements from a sewage outflow pipe). Improving the channels of communication and improving the understanding of the data collection methods will help.

    Bernard also asked what demographic groups do the citizen scientists belong to that have been helping out? Liz said our demographic groups are somewhat predictably white, middle class, educated and often retired people who have worked in professional industries. We do have some younger people involved and we also have some farmers who are working closely with the groups. We have lots of anglers and also wild swimmers. With all these things, you're relying on people giving up their time and they need to be sufficiently engaged and scientifically literate to want to go out and collect

these data. It is a self-selecting group and one of the things that we did try and explore with our school's programme was to try and figure out how do we get this beyond white, middle-class participants, but that's a problem we haven't quite solved yet.

AP March 06: Bronwen Martin, NRW to circulate a copy of Dr Liz Bagshaw's presentation on Citizen Science.

Item 7 Any Other Business

61. Dennis asked for an update regarding the Welsh Government Frequently Asked Questions (FAQ) for Tenanted Land document. Andrew said he was unable to provide an update because Matt has been involved with this – an update will be provided when possible.

62. Dennis asked about the plans for the site visit in April. Bronwen said she has a list of potential locations. Some people said they would double check and let me know so she would be following that up after the meeting. Once the potential locations have been confirmed they will be put forward to Zoe, and then we'll decide on a location. More information will be shared shortly.

63. The next WLMF Sub Group meeting will be held on Monday 17th April 2023.

64. No other business was raised.

Close meeting