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Detecting and avoiding impasse mechanisms for nature-based approaches to climate change adaptation in Ireland

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Report prepared for the Climate Change Advisory Council Adaptation Committee

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1. BACKGROUND

In its latest annual review, the Climate Change Advisory Council states that progress on climate change adaptation is limited to moderate across many sectors of society, except for Flood Risk Management and Water Quality / Water Services Infrastructure where progress was good. The progress was evaluated across three areas: risk, prioritization and adaptive capacity; resourcing and mainstreaming; and governance, coordination and cross-cutting issues. It is clear from this framing of the progress on climate change adaptation that there is a drive towards **systemic change**, as it is understood that the impacts of climate change are going to be felt across sectors and that the interdependence of the sectors will give rise to ripple effects that will propagate impacts on one sector to others. Systemic change is needed not only because of this interconnectivity of the different sectors, but also because resilience is a systems property, i.e. it is the configuration and diversity of a system that confers resilience (or lack thereof).

Systemic change can be brought about by governance and societal buy-in. It is therefore important to recognize what furthers systemic change and what hinders it. In the annual review of the Climate Change Advisory Council it was highlighted that currently climate change adaptation is driven by a relatively small community of committed policy makers. This shows clearly that a better understanding of societal dynamics that lead to uptake and propagation of innovative and resilient approaches is needed to unlock the 'triple dividend' of adaptation: avoided losses, reduced risk and increased productivity, as well as social and environmental benefits. In this research project, we investigated what the current perspectives of practitioners were on nature-based approaches. This is important not only to understand if there is buy-in to take these relatively innovative approaches in the Irish context, but also to understand what system changes are needed to scale their roll out in the Irish context.

2. INTRODUCTION

Incorporating nature and natural features in development is increasingly recognized as a way to address multiple and urgent environmental and social problems in integrated community-based projects (Bridges et al. 2021, Wickenberg et al. 2021). In natural and nature-based approaches (NbA), ecosystem processes are integrated in development and harnessed to deliver benefits (also called ecosystem services) to people. When this contribution of nature to human systems was first recognized in the Millennium Ecosystem Assessment (2005), it sparked the coining of the concept of 'natural solutions' when reflecting on the important role of protected areas in maintaining human well-being and addressing climate change (Dudley et al. 2010). Similarly, the idea of green and blue infrastructure highlights the importance of nature in infrastructure and development (Walmsley 1995). NbA are also beneficial in agricultural production and grazing management

and can be implemented directly by farmers or landowners. Direct economic benefits can be found for agricultural practitioners, in terms of increased yields or reduced costs, in addition to broader societal benefits (Iseman and Miralles-Wilhelm, 2021).

There are perhaps a dozen concepts that are related to the overall idea of natural and nature-based approaches to infrastructure and development (Bridges et al. 2021, p. 5, Sgrigna et al. 2021, p. 19). In this paper we call them nature-based approaches (NbA) to reflect the dynamic and adaptive nature of projects that are incorporating and harnessing both social and environmental processes to deliver sustainable, multi-benefit solutions to current societal problems.

The implementation of nature-based approaches requires transdisciplinary collaboration of multiple stakeholders with different perspectives (Bridges et al. 2021, Wickenberg et al. 2021). A first step in this collaboration is the identification of the different motivations and perspectives of stakeholders contributing to any nature-based approach. In Ireland, nature-based approaches have been used in urban development and infrastructure planning as well as in rural environments to reduce nutrient-loss to rivers and enhance habitats for biodiversity (Collier and Bourke, 2020). However, the roll-out of these nature-based projects seems to be nowhere near to the extent required for effective climate change mitigation and adaptation. Trends in the status of Irish biodiversity also show continued deterioration of habitats across the country (NPWS 2019). This apparent lack of transformation towards a more sustainable, nature-integrated path of development begs the question as to what the hold-up is. Why are planners, local authority staff, farmers, engineers and government officials not implementing nature-based approaches, even though best practice examples exist, and benefits are clearly recognized?

One suggestion comes from the literature on ‘barriers’ to implementation. Biesbroek et al. (2014) emphasise the dynamic complexity of governance of climate change adaptation and conclude that patterns of impasse are due to societal dynamics rather than being structurally ‘built’ into the system. In their research they analysed the difficulties encountered with the establishment of a water plaza in Rotterdam, as a climate change adaptation project. They found three kinds of dynamics can lead to impasse in the implementation of innovative solutions with multiple societal benefits. They term these processes risk innovation, conflict infection and frame polarization, briefly described as follows:

The risk innovation mechanism

Different perceptions of risk amongst stakeholders can lead to impasse. Where an open and transparent engagement process discussing the risks and how to manage them is required, the opposite takes place. The risk innovation mechanism often includes a tendency towards a technocratic stance and an over reliance on scientific language which doesn’t actually inspire confidence in the other party.

The conflict infection mechanism
Historic conflict between stakeholders can be carried forward into seemingly unrelated projects, giving rise to a preconception of distrust, weariness or scepticism. A good example in the Irish context might be the native woodland grant. It is important to note that actors do not consciously incur the conflict infection mechanism.

The frame polarisation mechanism
Frame polarization manifests itself in an alternative narrative around the proposed solution, which will prohibit the finding of 'common ground' amongst the parties involved.

Since nature-based approaches are often unfamiliar to people and are associated with a very different risk profile than traditional engineering solutions, we were interested in finding out if these impasse mechanisms could be present in an Irish context as they could explain why implementation of nature-based approaches is generally quite slow.

The overall objective of this study was to explore the attitude of Irish professionals towards nature-based approaches. Specifically, we wanted to investigate:

1. What environmental threats practitioners were perceiving.
2. How familiar they were with system thinking and transdisciplinary approaches.
3. If they perceived there to be any impasse mechanisms with regard to the implementation of nature-based approaches in Ireland.

3. METHODOLOGY

In total 17 semi-structured personal interviews with Irish policy-makers, ecologists, engineers, planners, NGOs, semi-state bodies and representatives from farming and forestry organisations were conducted between May and July 2020. The interviewees were selected to represent multiple strata of society working in both urban and rural contexts. A table describing the interviewees in further detail is given in Appendix 1.

The interview design was based around the exploration of four topics: i) the professional background and experiences with land management or land-related policy, ii) the current levels of understanding of the socio-ecological risks associated with climate change and biodiversity loss, iii) drivers and barriers across all sectors to systematically considering nature-based approaches; and iv) current progress towards systems-thinking approaches to combined socio-ecological challenges.

The study used grounded theory methodology adapted from Strauss and Corbin (1994) for the analysis of the interview material. This method consists of three steps: substantive coding, theoretical coding and the generation of a grounded theory.

A first step in the data analysis process was open coding - the clustering of common themes and narratives arising throughout the interview transcripts. Questions were removed from the transcripts so that the categorisation was on participant's responses only. Participants' understanding of the risks and benefits of NbA were compared, as was the level of knowledge of case studies, tools and guidance in a separate category. We also assessed interviewee's attitudes to nature, policy, and other societal groups, as well as categorising environmental and economic issues arising for Irish practitioners through the study. A mind map illustrating the coding process is given in Appendix 2, with further detail on the methodology of the data analysis.

In a second step, we identified impasse mechanisms described by Biesbroek et al. (2014) by matching reported patterns of interaction between actors with the patterns described in Biesbroek et al. (2014) that lead to impasses. A diagram to inform this framework was drawn up describing the essential patterns and elements of each of the three impasse mechanisms described in Biesbroek et al. (2014). This diagram is included in Appendix 2, and the interview transcripts were searched for reports of these patterns in the Irish context.

A final step was to generate quantitative data from the analysis of the transcripts. Examples of the mechanisms - both actual examples from participants' own experiences, and conceptual or perceived examples given to illustrate the respondent's thoughts - were grouped together so as to understand frequency of occurrence and to facilitate comparison. This data is included in Appendix 3. The quantitative data when presented graphically allowed for an overarching narrative - a grounded theory - to emerge.

4. RESULTS

4.1 Thematic Areas in NbA in Ireland

4.1.1 Major Themes

Shown below in Fig 1 is a word cloud created from analysing the interview transcripts in NVIVO. Of note are the major themes: prevalence of 'people', 'nature' and 'change', prevalence of 'farms', 'farmers', 'waters' and 'floods'. Additionally there is a notable absence of 'forests', 'trees' or 'woodlands', and an absence of public participation or community - although 'collaborative' does appear.

Fig. 1: Word cloud (based on participant answers only)

It is perhaps not surprising that the words people, nature and change appeared regularly in the interview process (Fig. 1). The projected impacts of climate change - flood disaster events in particular - was front and centre in participants' responses. Similarly, that farming received such emphasis also makes sense in the Irish context, where this activity covers 60% of the landscape. The absence of forests, trees and woodlands when considering NbA was surprising, however, as tree planting and afforestation are part of current policies on climate action. It emphasises the **absence of a woodland culture in Ireland**, a country with one of the lowest forest cover rates in Europe at just 11%. The absence of emphasis on public participation might reveal that understanding of how essential stakeholder and community involvement is for the implementation of NbA is lacking in the Irish context.

4.1.2 Interlinked Biodiversity Loss and Climate Change

Participants in the study with a background in environmental science were acutely aware of biodiversity loss, habitat loss and the synergies with climate change. They spoke of climate change and increased mobility facilitating invasive species, which makes it difficult to predict the impact on the resilience of native community assemblages. Two specific examples were given - the burrowing mite in bees and the arrival of the Asian hornet. Two of the three

farmers in the study agreed that biodiversity loss and climate change are interlinked and actually felt that current farming practices are a driver of these issues.

Representatives in the policy sphere spoke about major impacts associated with biodiversity loss in terms of food production, pollination, soil biodiversity and soil health and access to clean water. Both felt that climate action and biodiversity protection should be combined, however they felt that in Ireland the focus is on carbon sequestration and **biodiversity is ignored.**

4.1.3 Social Issues

The attitude or concept that farmers are the custodians of the countryside arose in many of the interviews. However, one ecologist felt that if this idea is examined, it is actually poorly understood. He thought that **people are disconnected from nature**, in both an urban and rural context. He said:

"the association between people and place has collapsed with globalization".

Another participant from this cohort spoke about the need to address the perception that the economy comes before our health or our natural environment. One of the policy-makers felt that the **sense of community has been eroded** in urban centres over the last few decades and that initiatives like NbA can go some way to repairing this.

The farmers in the study all made links between human health, nutrition and the food system. They expanded on the theme of disconnection in people's relationship with the food they eat, modern diets causing obesity and that people are disconnected from the land which provides for them, which ultimately impacts on mental health. Further insight into issues of disconnection within the current food system was given by the dairy farmer:

"people want cheap food, but that has to be done on a mass-produced scale. We could go back to more traditional farming, but we'd have to be getting more for the food we're producing, to make it viable. That's not a whinging farmer, that's a fact."

4.1.4 Benefits of Nature based Approaches

The environmental science cohort pointed to benefits of managing and improving biodiversity and ecosystem conditions as an integral part of building resilience to climate change. Further, they thought that multifunctional habitats can promote biodiversity, water quality, water storage, flood attenuation and carbon storage. Evidence of these multifunctional benefits of ecosystem restoration is certainly echoed in the literature (Schindler et al 2016). Two ecologists also pointed to the provision of a landscape that society can use and enjoy. One individual expanded at length on the multiple benefits of

forests, for changing the properties of upstream watersheds, providing stable habitats and soil stability and providing recreational opportunities for people. Another participant spoke about the **value of engaging and integrating the local community into NbA projects** and showed a good understanding of this aspect. He said:

"We've used NbA in our work, because we work directly with landowners to improve water quality by changing land practices on farms, in terms of reducing runoff, silt, sediment transport and nutrient management. The aim of the project is the conservation of the freshwater pearl mussel in Ireland and other aquatic species. The multifunctionality of the nature-based approach is absolutely paramount because it improves the habitat condition of peatland areas of farms, which improves the water retention capacity of the catchment and reinstates the naturalness of the hydrological regime, and then the peatlands deliver carbon sequestration for applied climate resilience and adaptation within the catchment system. Then there's also the economic return to the landowners to consider, it's so important not to overlook that".

Landowners and farmers interviewed for the study were more focussed on the application of NbA on individual parcels of land, as opposed to a wider socio-ecological frame. All agreed that they preferred **working with nature** as opposed to against it, and spoke about improving habitats for biodiversity, but integrating this into a wider context in terms of positive impacts on neighbouring land, water quality management or social improvement was missing from their responses.

4.1.5 Economic Issues

Interestingly, most of the participants thought that **restoring nature isn't expensive**. Seven of the 17 interviewees compared costs against alternatives, the cost of doing nothing and thought that the question of cost really depended on how the value was framed.

An engineer with the OPW in the study had direct insights into integrating NbA with flood relief schemes, where hard engineering solutions might mean building walls for flood defence. He felt that NbA in contrast - working out in the open to modify the landscape - can actually end up being lower risk and much cheaper. As a stand-alone cost it can seem expensive, but if integrated with existing activity, such as a moderate flood relief scheme, it could be a win-win. The same participant also spoke a great deal about insurance issues in relation to flood risk. The Insurance Federation of Ireland requires one in 100 year flood defence standards, to insure property. He felt that the technical and scientific understanding currently available to the OPW (and this seems to be supported internationally), is that despite broad support for NbA, these measures don't seem to solve large flood events.

Another engineer raised concerns about the **cost of ongoing monitoring and evaluation** as this is not traditionally done with hard engineering infrastructure. As nature doesn't always

necessarily act as planned, the application of NbA needs to include post-installation evaluation and adaptation, which in most cases wouldn't be budgeted for.

The farmers and landowners did express concern about financial trade-offs, particularly against productive yield and the business case for nature on their farms. The dairy farmer actually felt that converting to lower environmental impact farming practices would ultimately **lead to unemployment** as the efficiency of the current productive system would be reduced, due to lowering stocking rates. One of the policy-makers echoed this, in that she had come across this narrative within the farming community - she didn't agree that this was necessarily the case. However, this concern was not as prevalent in other respondents' answers, who in many cases are managing budgets as opposed to making their livelihoods directly from the land.

4.1.6 Systems-thinking and Collaboration

The environmental science cohort in the study felt that cross-sectoral work in Ireland, although improving, is not yet going far enough. One emphasised a need for the Department of Agriculture, Food and the Marine (DAFM), and the Department of Housing, Local Government and Heritage and the National Parks and Wildlife Service (NPWS) to collaborate with practitioners, ecologists, farmers and landowners to **devise practical ecological measures on the ground.** An ecologist interviewed for the study said that:

"I was advocating recently for the programme for government, or even within the new rural development program, that a panel of ecologists working in all the different areas, whether it's grasslands, woodlands or wetlands should be consulted as to how to pay farmers to manage habitats and ecosystems and restore areas, and be paid to do it. We're not there yet. I mean, we see some progress in policy, ***but they're not actually accessing the expertise****. Within projects that are already up and running, I've been receiving consultancy queries in relation to woodland management or constructing a wetland. So there is some collaboration, but we need a bit more joined-up thinking than that."*

One of the engineers spoke at length about cross-sectoral / cross-department discussion, but that many areas seem to be represented by the same core group of people and that greater mass and **diversity** is needed. He expanded on funding issues for the NPWS, in that they are so **under-resourced and over-stretched** that they cannot even supply staff to attend stakeholder meetings. However, in contrast, a senior executive engineer in one of Dublin's councils spoke about recent successes in collaboration with the parks department on NbA and felt that these are generally lower-cost solutions. He said:

"they're coming to us and saying 'we'd love to put a wetland in here' and we're saying well actually we're flooding that area during a 100 year event so this will work very nicely. We're

pushing open doors with our parks colleagues. It's initially driven by our own needs to prevent flooding using these nature based solutions."

The farmers and landowners spoke about community groups where knowledge and skills are shared with other farmers. However the theme of NbA had not really come up on these fora. As a group, they felt that efforts towards finding information or support for new initiatives met with difficulty, and that any dealings they had with farm inspectors was largely a **negative, top-down experience** with no open dialogue. One farmer said that:

"The only interaction with the County Council really is when inspectors come out. For, say, the water quality or stuff like that. But it needs to be done more on a softly, softly approach, rather than coming threatening you with fines and everything else. It's fairly heavy handed when they do come out. It would work much better if it was a joint effort rather than top down."

4.2 Dynamic Impasse Processes in Ireland

4.2.1 The Three Impasse Mechanisms

A further in-depth analysis of the interview transcripts revealed several instances of either actual or conceptual impasse mechanisms being both triggered or avoided in different scenarios. As explained previously, the identified mechanisms were the risk innovation mechanism, the frame polarization mechanism, and the conflict infection mechanism. A table showing all instances of the mechanisms that arose throughout the study is given in Appendix 3.

4.2.2 Impasse Mechanisms: Triggered

4.2.2 (a) Risk Innovation - triggered

Examples of the risk innovation mechanism appeared regularly, when participants spoke either of issues that had arisen previously when trying to introduce new ideas, or when describing their perception of *other* actors' concerns in the changing of land use/ implementation of nature-based approaches. In this study, 12 actual examples of the risk innovation mechanism were found, and 7 conceptual examples were given. Actual risks were borne either by farmers or landowners (5 examples) or by local authorities and the public (7 examples). Examples were also given by participants of perceived risks for policy-makers, resulting in an impasse or delay in implementing NbA, in that existing legal structures or frameworks make it very difficult to innovate. Four conceptualised examples were given of perceived innovation risks for policy-makers and local authorities, and 3 perceived innovation risks were given for farmers, foresters and landowners.

4.2.2 (b) Conflict Infection - triggered

The conflict infection mechanism arose in a number of instances throughout the interview process. Negative sentiment towards policy-makers, towards DAFM in particular, and in reference to Ireland's land use policy failures, were captured in 6 actual given examples. In all, 6 examples of conceptualised conflict infection mechanisms were given, including instances referencing perceptions of developers (1), perceptions of environmentalists (1) and perceptions of farmers (2).

4.2.2 (c) Frame Polarisation - triggered

Characteristic of the frame polarisation mechanism is stereotyping and strong arguments, and the removal of moderate and rational voices. Throughout the interviews, there were a number of stereotypes apparent when the different cohorts were describing each other - 4 examples of framing of an environmentalist cohort vs. the farming community, 1 example of traditional turf-cutters vs NGOs. Frame polarisation appeared even more frequently in a conceptual sense with **7 examples of stereotypes in reference to the conflicting views of the environmentalist cohort vs farmers**, and 6 further perceived polarised views between engineers and environmentalists, and again between local authorities and national policymakers.

Examples of triggered frame polarisation:

One participant - an ecologist - felt that irish society has been opertating for a long time in silos with quite strong individual remits, that actors come to the same issue but from very different perspectives. He saw himself in a "nature conservation" silo, as against a farmer who's in agricultural production He thought that the objectives of each actor are very different, but that there should be a potential to find a compromised position that could deliver more for both without impacting on the other. His feeling was that, as a society, there is potential for change, but that people from various communities are stillvery much bound by their individual remits. He noted that the policies underpinning the different remits don't seem to have changed enough.

Another participant spoke of the differing perspectives of engineers as against environmental scientists. She thought that engineers have a particular way of understanding, a view of the world, largely in measurements, numbers and boxes, but that ecologists tend to have a softer approach, not as exacting. This means that if consideration is requested for a wetland for example, during the planning phases of a housing or commercial development, that engineers might struggle with balancing the question of flooding and measuring flows of water. Comparing a pipe versus a wetland - how it operates and how efficiently. She felt that further case studies are needed, and crucially, more monitoring of such solutions, so this information can be fed back into the system. She thought that this might give engineers more confidence in NbA.

4.2.3 Impasse Mechanisms: Avoided

4.2.3 (a) Risk Innovation - avoided

Throughout the interview process, there were examples given of instances and situations where the potential for the identified impasse mechanisms to occur were avoided. 8 examples of the risk innovation mechanism being avoided in actual, real-life situations were given, and a conceptual example given in one instance.

Examples of avoided risk innovation:

*References were made to successful European Innovation partnerships, in particular the Keery Life Pearl Mussel Project, where collaborations had resulted in practioners and participants being **positively incentivised** to partake in biodiversity enhacing projects.*

*The risk innovation impasse was avoided in the development of urban areas, where developers were **engaged at an early stage** in the planning stages to provide green roofs and amenity areas that could also act as water attenuation measures. Various references were made to flood relief schemes for Dubli'ns rivers, including the Dodder and Poddle, that have successfully incorporated NbA.*

4.2.3 (b) Conflict Infection - avoided

Analysing the data from the interviews revealed 7 actual examples of avoidance of the conflict infection mechanism. These examples all appeared when interview participants referenced successful collaborative efforts - between farming communities and environmental scientists (for example within the European Innovation Partnerships (EIPs) such as the Burren and Kerry Life), between policy-makers at the national and local authority level, and successful collaborative projects with local communities, environmental scientists and policy-makers. A further 2 conceptual examples were given during the interviews.

Example of avoided conflict infection:

The Slow Waters project of the EPA was given as an example by one participant. This is an integrated catchment management approach, which implements water measures across all sectors at once, including community groups. The project has put community water officers in place, working with catchment assessment teams who are responsible for finding local problems, and local solutions. These initiatives are supported by a national technical implementation group, and a whole raft of other governance structures which are built around streamlining the policies to address water issues. This has set a strong foundation for taking the next step, which is to address the multiple benefits for biodiversity, climate adaptation, flood attenuation and recreational values for local people.

4.2.3 (c) Frame Polarisation - avoided

Examples of the frame polarisation mechanism being avoided were also given during the interviews, although to a lesser extent than the other mechanisms. 3 situational examples were given of this mechanism being avoided, 2 of which were in direct reference to the activities of Bord Na Mona (BNM). This interview participant spoke of BNM doing a great deal of engagement work with different stakeholders, including neighbouring landowners, biodiversity heritage forums, and the Irish Peatlands Council. A conceptual example of frame polarisation avoidance was given by one of the interviewees from the farming community. He said that:

"Farmers listen to other farmers. It's an evidence base piece that's needed. If the leaders can embrace the new methods, then the mob will follow."

4.3 Ireland's Overarching Narrative

4.3.1 Triggering of Impasse Mechanisms

The findings of the data analysis - impasse mechanisms triggered - are illustrated in Fig. 2.

An in-depth analysis of the interview transcripts revealed 53 impasse mechanism examples, both actual and conceptual. The chart shown here represents the mechanisms in percentages of frequency of occurrence.

R. I. = Risk Innovation
C. I. = Conflict Infection
F. P. = Frame Polarisation

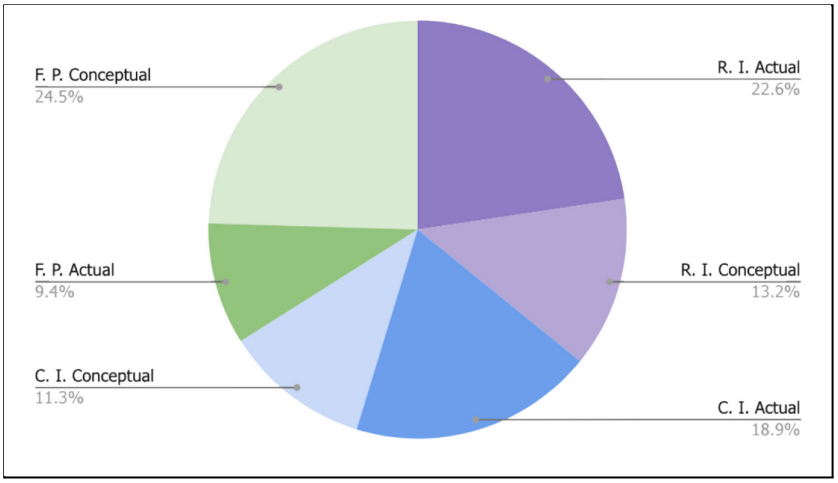
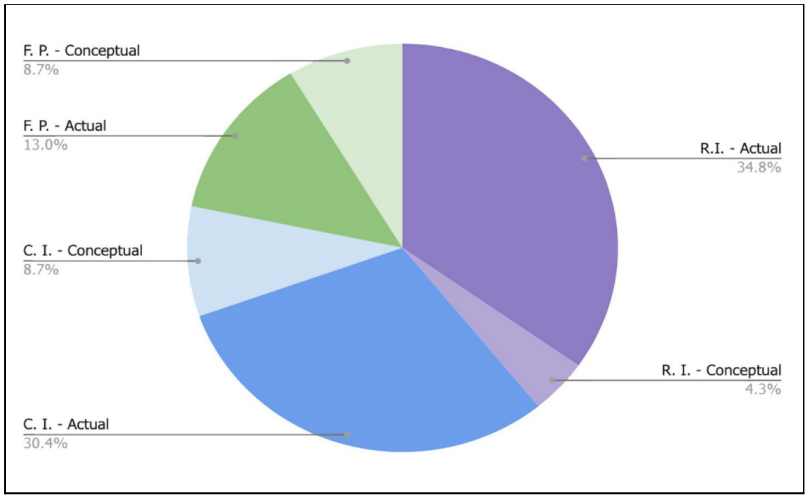


Fig. 2: Examples of triggered impasse mechanisms

The greatest portion of triggered impasse mechanisms found were those in the *conceived* frame polarisation space (F.P. Conceptual: 24.5%). Stark differences between the environmental cohort and the farming community were highlighted, and repeated references were made to the differences between environmental scientists/ ecologists, and engineers.

4.3.2 Avoiding Impasse Mechanisms

The findings of the data analysis - impasse mechanisms avoided - are illustrated in the chart below (Fig. 3).



The analysis revealed 23 impasse mechanism (avoided) examples, both actual and conceptual. The chart represents the mechanisms in percentages of frequency of occurrence.

R. I. = Risk Innovation
C. I. = Conflict Infection
F. P. = Frame Polarisation

Fig. 3: Examples of avoided impasse mechanisms

Throughout the study, participants gave a number of examples of the risk innovation mechanism being avoided (R.I. - Actual: 34.8%) in real-life scenarios through the incentivisation of practitioners, demonstration and modelling, and early engagement of stakeholders in both rural and urban settings. It appears that the pathway to successful adoption of NbA is through the **combined leverage points** of integrated governance, fair financial mechanisms and community-based action.

5. DISCUSSION

The IUCN guidelines on nature-based solutions state that NbA must effectively address societal challenges such as job creation and human wellbeing, and that they must be based on inclusive, transparent and empowering governance processes (IUCN,2020). In these guidelines, the design of the feedback and grievance procedure is important, as is **identification of all stakeholders** (IUCN, 2020). Bridges et al. (2021) go further by stating that there are five principles that underpin successful implementation of NbA: Identifying solutions that have multiple benefits, use a systems approach to leverage existing components and projects, engage communities, anticipate and evaluate risk and manage adaptively. These five principles are grounding the project in the local context and are assuring that stakeholder and community priorities are reflected in the approach taken (Bowe et al, 2021 p.135). As we have shown in this research, engagement also is essential to gain local support and avoid conflict.

Despite the general recognition in the literature that engagement is essential for implementation of NbA, we did not find much evidence of **participatory planning** for NbA on the ground in Ireland. Only one of the study participants referred to the published guidelines and available toolkits during their interviews. This points to a skills gap in systems-thinking and in negotiation and collaboration for solutions-based initiatives as evidenced in the literature (Frantzeskaki et al, 2020). Many participants felt that there is greater cross-sectoral and cross-departmental collaboration underway, and those working in the public policy sphere were able to reference wider stakeholder participation than would have previously been the case, but they did feel that there is still room for huge improvement in this area, as was also highlighted in the recent annual review by the Climate Change Advisory Council. Collaboration seems to be happening horizontally in the Irish context but not vertically or multi-laterally.

As stated in the 6th National Report to the Convention on Biological Diversity, "a **transformational change** is required to achieve the Vision in the National Biodiversity Action Plan 2017 - 2021" (DCHG, 2019). The Future Is Now Report (UN, 2019) echoed this sentiment and clearly describes a systems-based approach to achieving the UN sustainable development goals, as these cannot be successfully addressed in isolation. This same report outlines four levers for transformation: science and technology, economy and finance, governance, and individual and collective action. When taking a technocratic approach to transformation, it is often the case that developments in science and technology as well as economy and finance are overemphasised when pushing for adaptation, whereas the role of governance as well as individual and collective action is not emphasised enough. Our research shows that particular attention needs to be paid to governance issues and the identification of enabling action for individuals and collectives, to aspire a more nature-integrated approach to societal problems, including preparation for climate change impacts. We also showed that amongst the six entry points for transformation (UN, 2019), nature-based approaches could be particularly beneficial for driving transformation in food systems and urban environments.

Examples were given throughout the study of progress in the adoption systems thinking for nature-based approaches, and it seemed from some responses that the value of engaging and **integrating local communities** into NbA is beginning to be understood. Both the Kerry Life European Innovation Partnership and the Inishowen Rivers Trust were given as good examples of this. Indeed, as shown in the results, the greatest number of impasse mechanisms being avoided was the risk innovation mechanism, through integrated policies and **collaborative** work. However, interviews with landowners, farmers and foresters on the ground revealed a lack of participation and dialogue. It appears that policies and plans are being developed at an administrative level, with practitioners and stakeholders brought in at a later stage - ie not necessarily informing the design.

5.1 Challenges

The study has shown that the introduction and implementation of nature-based adaptation measures in Ireland brings some very novel challenges. Issues that arose were **fears around costs and risks** - of transitioning and ongoing maintenance; and unemployment, particularly for the farming community.

Further highlighted issues were more systemic - the theme of **disconnection**, in many facets, arose regularly among participants' responses. Disconnect was perceived between policy-makers and practitioners, and again between communities in the urban and rural sense. Further, there was a sense that people are disconnected from nature, both urban and rural and that there is an eroded sense of **community**. Farmers in the study spoke about disconnection in people's relationship with food and the implications of this for the agricultural system, which is under pressure in Ireland and globally. Addressing this issue is crucial, as failure to focus on the environmental impacts of food production will result in negative feedbacks on food systems, that is, water shortages, extreme weather events, soil infertility and possible changes in the nutritional quality of produce (UN, 2019). Ecological disconnection in the form of habitat fragmentation was voiced as a concern by the ecologists interviewed - especially how the lack of consideration for habitat connectivity can influence resilience of natural systems and their vulnerability to increased threats from invasive species due to climate change.

Notable was participants' perception of a disparity in 'environmental progress' at individual vs the national policy level; for the farming cohort, that dealing with farm inspectors is a **negative, top-down** experience; and an **absence of a woodland culture** in Ireland. Apparent were **conflicting views** of environmentalists vs farmers, and ecologists vs engineers, giving evidence of deep-rooted cultural biases leading to impasses. These challenges will be discussed in what follows.

5.1.1 Risk

A potential major contributor to a triggering of the risk innovation mechanism as evidenced by this study is down to consideration of, and sharing of, financial risk. Although farmers, landowners, land managers and foresters all thought that restoring nature shouldn't be expensive, they did express concerns over financial burdens, loss of opportunity, trade-offs and fear of unemployment. This prevalent narrative amongst the agricultural community is compounded by divergent policies. A research officer with Teagasc interviewed for the study said that:

"farmers are incentivized by current farm subsidies to remove certain habitat areas on their farms, because they are deemed ineligible for the single farm payment. However, in contrast,

environmental experts advocate for farmers to retain these very same habitats, because of their high ecosystem services value."

The dairy farmer interviewed had personal experience of divergent policy, when trying to retain habitat on his farm and losing out financially as a result. He said:

"we've a half acre orchard here with a wildflower meadow. If it's included when the basic farm payment is calculated, it results in a penalty, which is greater than the half acre is worth. Hedgerows are the same - the easy thing to do would be to bulldoze them all and have one big field, with just electric fences delineating it. I wouldn't like to do that, but hedges are taken out of the basic farm payments. They get the map out and they digitize it. If you've got 0.2 of a hectare under a hedge, you don't get paid for that."

Further to the issue of costs is the under-funding of another major stakeholder, the National Parks and Wildlife Service. The OPW Environmental Lead spoke about a need and desire to collaborate with the NPWS, inviting their staff to stakeholder meetings, but had run into problems with this as this body is severely underfunded and under-resourced. This issue is certainly reflected in the literature (Bullock and Morrison, 2018). There is a danger of triggering the risk innovation mechanism here - if stakeholders cannot be involved in the development and design of innovation from the outset, they may resist new projects later in the process.

References in the study to issues with insurance for the application of NbA in Ireland is also backed up by the literature. A systemic governance problem was exemplified in Ireland in the case of an attempt to introduce innovative disaster risk management in Skibbereen, County Cork in 2009, following an extreme flood event. A plan for an environmental park was rejected by residents who instead established their own committee and advocated for a structural flood defence. The issue for residents was at government level, as the Insurance Federation of Ireland are very slow to restore cover in flood risk areas (Thaler et al., 2018).

In the context of this discussion, it might be beneficial to use systems thinking to explore the idea of risk beyond the concept of financial risk (Bridges et al. 2021). In stakeholder engagement processes, when negotiating acceptable risks in the introduction of innovation, assessing the risks of *not* adopting NbA to climate change adaptation might also include the wider issues of safety, insurances, extreme heat, and biodiversity loss leading to ecosystem collapse. The conversation around trade-offs, and the multiple benefits of NbA, becomes broader under this application.

5.1.2 Disconnect from Nature

Many references were given throughout the interviews to a disconnection from nature, and this issue has also been covered in the literature (Koger and Winter, 2010, Prévot-Julliard et al, 2014). This disconnection seems to underpin a mistrust in the capacity of nature and natural features to provide resilience - both social and ecological - to the coming disruption of climate change and its associated impacts. This mistrust in turn seems to be triggering the risk innovation mechanism in a number of given scenarios throughout the study.

The lack of a woodland culture in Ireland, as evidenced by this study, highlights a deep-rooted systemic problem that warrants further investigation. The island was once covered in a mosaic of native woodland and the people of ancient Ireland had a significant relationship with trees (Fields, 2020). Although reforestation has been underway over the last century in Ireland, most significantly since the 1940's, there is today a lack of a woodland culture in this country. That only three of 17 respondents in this study pointed to the value of trees and woodlands in implementing nature-based adaptation to climate change, is concerning. It seems that Irish practitioners working directly with nature and the land do not associate the island of Ireland with trees. The perception of Ireland as an agricultural nation (and the lack of awareness of the benefits of agroforestry) may be hampering a return to semi-natural woodlands needed for ecological resilience to the coming impacts of climate change.

As mentioned by the policy-makers interviewed for the study, environmental concerns and subsequent action seem to be greatly focussed on climate change, reducing energy needs and curbing emissions, and **biodiversity is ignored**. According to Nature4Climate, nature-based approaches could offer 30% of the solutions to climate change, while enhancing biodiversity, but make up only 3% of funding and 10% of the conversation. A review of the Climate Ireland's adaptation case study directory found 51 described projects, of which **only 11 are green**. Ireland's most recent budget 2022 allocated €95m to support the conservation and enhancement of our built and natural heritage and support for jobs, and €858m to support the transition to a climate-neutral, circular and connected economy and society. It appears that the multiple benefits of NbA are still not fully appreciated at the national or societal level. There is clearly much work to do.

5.1.3 'Us & Them'

The study uncovered a range of evidence of disconnection and conceptual barriers between people of different backgrounds and demographics. This legacy of specialisation and fragmentation in industry and academia, coupled with the distancing of urban and rural populations, and even within communities, was evidenced in such terminology as 'silos, 'individual remits', 'agendas' and 'differing perspectives'. The emergent overarching narrative

revealed by the research analysis is that people feel that they are very different from each other, and that they cannot understand one another.

In the eyes of study participants, farmers were described as ‘conservative’, ‘addicted to fertiliser’ and ‘blind to the benefits of nature’. There was an assumption that the farming community has a ‘grá (love) for the land’ that is linked to green fields as far as the eye can see, and that farmers view nature as unwanted and untidy. In contrast, agricultural practitioners and landowners interviewed referred to environmental scientists as ‘unhelpful’, ‘alternative’ and ‘pony-tailed’, and that the Green Party, the environmental movement, and public opinion, are ‘aggressive’. As mentioned in the results section, a similar framing is happening between ecologists and engineers.

This framing was also apparent at different strata of society - ecologists in the study frequently referenced issues with policy-makers, particularly at national level, in that the feeling was that there isn’t currently a recognition of the expertise on the ground.

This issue is important to note as the development of NbA needs to be place-based and suited to local conditions (Frantzeskaki, 2019). If Ireland is to create a national nature-based framework, it must be done in consultation with a diverse range of stakeholders, and be cognisant of the different ecological and social conditions at regional and even catchment level (Ahern, 2011). It also will be essential to make sure the complex nature of socio-ecological systems is recognized and that there is room to allow for societal dynamics to play out and creative solutions to emerge (Zivkovic 2015).

5.2 Progress

5.2.1 Personalisation and Narrative

One participant was able to reference two successful examples of engaging residents in her area in biodiversity enhancement programmes. The local county council had done a trial in 2017, setting aside pollinator areas, and then rolled them out gradually to familiarise the public with them. At first, the council received many complaints that these areas looked unkempt and rough. Following this an informational campaign was implemented, calling it a ‘slow to grow’ project, with leaflets and targeted mailouts. This resulted in greater buy-in from the local community. Her takeaway from this was that there needs to be **time allowed for local people** to gradually get used to new initiatives and innovations.

The same study participant went on to speak about her experiences in helping local people visualise the values of connected habitats for ecosystem services in her area. She said that when speaking to local residents about a wildlife corridor plan, the idea wasn’t easily coming immediately into people's minds. But when she showed a GIS map illustrating wildlife

corridors, they found this both engaging and inspiring. When residents could see the county level and **recognise their own homes** or local area, the idea connected and personalised in their minds.

The above approaches - working with people in the local area and starting to build a community-based ecological restoration narrative - are good examples of taking steps towards avoiding the triggering of the risk innovation mechanism.

5.2.2 Integration and Engagement

Progress has been achieved in Ireland towards transdisciplinary work in recent years. A recently published white paper from the Royal Irish Academy entitled 'Better together: knowledge co-production for a sustainable society' outlines 49 case studies of projects where the co-production model was used - and indeed some of the projects as referenced by this studies' participants are included (Bolger et al. 2022).

In 2015, a group of researchers in UCD developed a methodology for an interactive, group-based knowledge co-production process for diverse stakeholders in county councils, for the engagement with and planning of green infrastructure (GI). This methodology, which draws on the literature on the sociology of interactions, gamifies the engagement process and thereby breaks down traditional silos and barriers (Lennon et al. 2015). The approach consisted of working with selected policy actors, based on a 'board game' (GI Quest) to simulate GI planning dilemmas, with the specific aim of breaking down institutional and disciplinary barriers among policy stakeholders who hold key information or are necessary for successfully implementing GI. The result was that the continuous blurring of interpretive frameworks between entertaining interaction and real-life planning problems helped to generate new meaning through social interaction (Lennon et al. 2015).

This approach, which worked with people from various policy arenas (who may even have had a previous history of negative interactions) allowed for a neutral and creative space for participants to engage and to break down institutional silos. This concept could be further developed and workshopped in wider community settings as a step towards avoiding the triggering of the conflict infection mechanism or the frame polarization mechanism.

6. SUMMARY AND CONCLUSION

The main question of this research was to ask why planners, local authority staff, farmers, engineers, and government officials are not embracing and implementing nature-based approaches - certainly not to the extent required for effective climate change mitigation and adaptation - even though best practice examples exist, and benefits are clearly recognized.

The research was designed to cover a broad, transdisciplinary cross-section of Irish practitioners, working at various scales and with differing perspectives and touchpoints with nature. The data analysis was a three-stage process to reveal the patterns of thinking in relation to NbA in Ireland, in order to identify social and attitudinal barriers. The study sought to explore the mechanisms that trigger barriers to innovation using a framework derived from the study of an intervention in Rotterdam. In total, 53 examples of impasse triggers were identified throughout the study, with negative framing arising as an overarching issue. In addition, a gap in Ireland's collective cultural consciousness around the value of trees and woodlands was apparent.

It appears that the hold-up in the implementation of nature-based approaches for climate change adaptation is due to a range of deeper, more complex issues than a 'static knowledge gap' or the lack of tools and data - although these problems do also exist. Participants in the study showed a deep respect for nature and biodiversity, wanted to work with nature as opposed to against it, and were emotive about Ireland past vs present. All interviewees felt that they had witnessed degradation and decline of Ireland's nature and countryside in their lifetimes and indicated a will to make positive change. However, they frequently drew distinctions between their language, agenda and values, and those of 'others'. It might be that uptake of NbA in Ireland is slow due not to actual barriers - but due to complex, underlying, **deep-rooted cultural biases**, such as negative framing, costs and insurances, and compounded issues and feedbacks in the wider food system.

To overcome the triggering of impasses such as the risk innovation mechanism, and to build towards social and ecological resilience in tandem, open and transparent dialogue with a diverse range of collaborators is key. In his interview, the OPW Environmental Lead spoke about cross-department and even cross-sectoral discussions and engagements, but he pointed out that greater mass and **diversity** is needed. Conversations around nature are still happening in an echo chamber.

However, working with a diverse range of stakeholders brings its own challenges in the recognition of, and avoidance of, the negative framing of different people and societal groups. The Irish Royal Academy white paper highlighted that some of these challenges can be addressed by **managing relationships** and maintaining trust, and engaging early to co-design and build a shared understanding (Bolger et al. 2022). However, the same report does acknowledge that **co-production costs more for all stakeholders, but such costs are generally offset by the higher effectiveness of such approaches**.

It seems from the study that inroads and progress towards NbA have been made in Ireland by individuals and individual projects on the ground, however a coordinated approach and institutional support is lacking. Policies around land-use are currently in direct opposition to each other and this is resulting in negative impacts on both people and nature on this island. Governance structures that are top-down and technocratic invoke resistance to innovation -

governance should instead be seen as a mechanism to provide support, guidance and the development of capacity for place-based initiatives that leave room for creativity (Berkes 2007, Zivkovic 2015). Local cooperation is required to ensure ongoing success of NbA, giving rise to a need for well-designed governance **partnerships** to help to embed scientific knowledge in the local **culture** (Frantzeskaki et al., 2020).

The theory of the adaptive resilience cycle (Holling, 1986, Fath, Dean and Katzmair, 2015) tells us that systemic memory is vital for moving from collapse into the reorganisation phase. It is therefore essential that nature and biodiversity action plans and policies recognise the scale of the current ecological crisis, and the practices and thought processes that have caused and continue to exacerbate the issues.

Ultimately, this study has shown that in the Irish context, our cultural norms, beliefs and values have moved away from our connection with nature, and to each other. To develop a systems approach to collaboration, background, history and culture need to be recognised and acknowledged as vital building blocks of people's perspectives. To be effective, collaborative efforts towards building resilience must be explicitly based on, and informed by, the environmental, ecological, social, and economic drivers and **dynamics of a particular place**, and must be integrated across a range of linked scales (Pickett et al., 2004), i.e. local and national NGOs; local, regional, and national governments; international donor agencies and other organisations; and universities and research centres.

7. RECOMMENDATIONS

- Transformational thinking and significant investment is required to address the downward trend in Ireland's biodiversity, with the aim of achieving multiple benefits of social, ecological and economic restoration and resilience to the effects of coming climatic change.
- Knowledge co-production is expensive but is essential for community engagement and participation that is meaningful and long-term. Significant investment is required to integrate and embed nature-based approaches in local and community settings, and to ensure that the natural environment is incorporated into community conversation and local development plans.
- Research funding should allow space for creativity, emergence and innovation in locally-engaged projects - the institution should provide the scaffolding and support, the actions should be prescribed by stakeholders on the ground.
- Greater emphasis needs to be placed on nature-based approaches to adaptation within the existing framework - existing frameworks and plans such as the National Development Plan (NDP), local authorities' climate action plans and biodiversity action plans. The biodiversity crisis should be at the forefront of institutions working

on climate action such as the Climate Action Regional Offices (CAROs) or Climate Ireland.

- Biodiversity Action Plans should be developed *in tandem* with Climate Action Plans, and co-created through a consultation process that includes engagement with landowners, NGOs and community groups, ecologists, CAROs, the EPA, local businesses, schools and educational institutions.
- Indicators used for tracking progress on climate change adaptation should include indicators on 'restorative' action, i.e. action that includes nature and heritage protection and restoration. Furthermore, indicators on progress of furthering participation should also be included, because empowerment of communities and street-level workers is crucial to meet international challenges with local action, so indicators on progress of furthering participation should also be included.
- Early engagement is key, and identification of stakeholders should be done systematically following best practice. Opportunities should be sought to work across sectors, public – private partnership, with people from diverse backgrounds. Representation from local people or people with local knowledge will bring depth to projects.
- When first getting together – look out for impasse mechanisms, such as conflict infection or different perceptions of risk. Address these issues as they arise by letting people fully express their concerns and address them directly. For conflict infection, it is often advisable to draw up a clear memorandum of understanding so all parties involved know about their roles and responsibilities, but also what to expect.
- For different perceptions of innovation risk try to broaden the framework within which risk is defined and assessed. If risks from climate change and biodiversity loss are factored in, the seeming greater uncertainty for nature-based approaches (in comparison to engineering solutions) often 'disappears' as engineering solutions are exposed to similar unquantifiable risks. Keep an open mind for hybrid solutions, but push for fully nature-based approaches as they tend to have a higher biodiversity benefit.
- A nature-based adaptation approach will necessarily entail a different mindset than an engineering solution: there will be surprises and unanticipated changes. Regular monitoring will be needed, as might regular intervention, until the system becomes self-sustaining. It also has to be accepted that the solution will not always 'look the same', i.e. that the aesthetic qualities of the project will change over time. This could be seen as an advantage, as it allows for provision of variety and a measure of the seasons passing.
- Ensure that costs of climate change impacts versus adaptation options are not just compared from an economic perspective, but that societal governance resources and natural capital are factored in as these can help unlock the resources needed for climate change adaptation.

8. References

Ahern, J. 2011. From fail-safe to safe-to-fail: Sustainability and resilience in the new urban world. Landscape and Urban Planning 100: 341 - 343

Berkes, F. 2007. Community-based conservation in a globalized world. Proceedings of the Natural Academy of Sciences (USA) 104: 15188–15193

Biesbroek, G. R., C. J. A. M. Termeer, J. E. M. Klostermann, and P. Kabat. 2014. Rethinking barriers to adaptation: Mechanism-based explanation of impasses in the governance of an innovative adaptation measure. Global Environmental Change 26: 108-118.

Bolger, P., P. Brereton, O. Grant, and D. Torney. 2022. RIA White Paper. Better together: knowledge co-production for a sustainable society. Royal Irish Academy. Dublin.

Bowe, C., Scott, A., Smith, A., Chamberlain, B., and L. Clavey. 2021. Nature-based Solutions for climate change in the UK: A Report by the British Ecological Society. Ch. 9

Bridges, T. S., J. K. King, J. D. Simm, M. W. Beck, G. Collins, Q. Lodder, and R. K. Mohan, editors. 2021. International guidelines on natural and nature-based features for flood risk management. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Bullock, C. and R. Morrison. 2018. A national biodiversity expenditure review for Ireland: Final project report. Technical Report. UCD.

Collier, M. and M. Bourke. 2020. The case for mainstreaming nature-based solutions into integrated catchment management in Ireland. Biology and Environment: Proceedings of the Royal Irish Academy 120B: 107-113.

Dudley, N., S. Stolton, A. Belokurov, L. Krueger, N. Lopoukhine, K. MacKinnon, T. Sandwith, and N. Sekhran. 2010. Natural solutions - protected areas: Helping people cope with climate change. Gland, Switzerland, Washington DC and New York, USA.

Fath, B. D., Dean, C. A. and H. Katzmair 2015. Navigating the adaptive cycle: an approach to managing the resilience of social systems. Ecology and Society 20: ES-07467-200224.

Fields, T. 2020. Trees in early Irish law and lore: Respect for other-than-human life in Europe's history. Ecopsychology 12: 130-137.

Frantzeskaki, N., Vandergert, P., Connop, S., Schipper, K., Zwierzchowska, I., Collier, M., and M. Lodder. 2020. Examining the policy needs for implementing nature-based solutions in cities: Findings from city-wide transdisciplinary experiences in Glasgow (UK), Genk (Belgium)

and Poznań (Poland). Land Use Policy 96: 104688.

Iseman, T. and Miralles-Wilhelm, F. 2021. Nature-based solutions in agriculture – The case and pathway for adoption. Virginia. FAO and The Nature Conservancy.

IUCN. 2020. IUCN Global Standard for Nature-based Solutions A user-friendly framework for the verification, design and scaling up of NbS. First Edition. IUCN, Gland, Switzerland.

Koger, S.M and D. D. N. Winter. 2010. The psychology of environmental problems, 3rd edition. Taylor & Francis, New York.

Lennon, M., Scott, M., Collier, M., Foley, K., 2015. Developing green infrastructure 'thinking': devising and applying an interactive group-based methodology for practitioners. Journal of Environmental Planning and Management. 59: 843-865.

Lynn, D. and O'Neill, F. 2019. The status of EU protected habitats and species in Ireland. Volume 1: Summary Overview. NPWS https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol1_Summary_Article17.pdf

Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: current state and trends. Island Press, Washington, DC.

Pickett, S.T.A., Cadenassso, M.L., and J. M. Grove. 2004. Resilient cities: meaning, models, and metaphor for integrating the ecological, socio-economic, and planning realms. Landscape Urban Planning. 69: 369–384.

Prévot-Julliard A., Julliard, R., and S. Clayton. 2014. Historical evidence for nature disconnection in a 70-year time series of Disney animated films. Public Understanding of Science. 24: 672-680

Raymond, C., Berry. P., Breil, M., Mihai, N., Kabisch, N., de Bel, M., Enzi, V., Frantzeskaki, N., Geneletti, D., Cardinaletti, M., Lovinger, L., Basnou, C., Monteiro, A., Robrecht, H., Sgrigna, G., Munari, L. and Calfapietra, C.. 2017. An impact evaluation framework to support planning and evaluation of nature-based solutions projects. Report prepared by the EKLIPSE Expert Working Group on Nature-based Solutions to Promote Climate Resilience in Urban Areas. Centre for Ecology & Hydrology, Wallingford, United Kingdom.

Schindler, S., O'Neill, F. H., Biró, M. Damm, C., Gasso, V., Kanka, R., Van Der Sluis, T., Krug, A., Lauwaars, S., Sebesvari, Z., Pusch, M., Baranovsky, B., Ehlert, T., Neukirchen, B., Martin, J., Euller, K., Mauerhofer, V., and T. Wrbka. 2016. Multifunctional floodplain management and biodiversity effects: a knowledge synthesis for six European countries. Biodiversity

Conservation 25: 1349–1382.

Sgrigna, G., López-Gunn, E, Dubovik, M., Di Sabatino, S., Kumar, P., Feliu, E., Ruangpan, L., San Jose, E., Sanchez, R., Van Cauwenbergh, N., Vojinovic, Z., and Wendling, L. 2021. 01. Why is it important to evaluate the impacts of NBS? in A. Dumitru and L. Wendling, editors. Evaluating the impact of nature-based solutions: A handbook for practitioners. Publications Office of the European Union, Luxembourg.

UN. 2019. Global Sustainable Development Report 2019: The Future is Now – science for achieving sustainable development. United Nations, New York. https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf

Walmsley, A. 1995. Greenways and the making of urban form. Landscape and Urban Planning 33:81-127.

Wickenberg, B., K. McCormick, and J. A. Olsson. 2021. Advancing the implementation of nature-based solutions in cities: A review of frameworks. Environmental Science and Policy 125:44-53.

Zivkovic, S. 2015. A complexity based diagnostic tool for tackling wicked problems. Emergence: Complexity and Organization 17 (4).

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Appendix 1: Table of Participants

Number	Job Title	Location / Organisation	Male / Female	Area of study	Area of work
1	Project Manager	Kerry Life	Male	Ecology	EIP Project Manager
2	Environmental Educator	UCD	Female	Forestry	Education,EIA, Advisor to Peatlands Council
3	Biodiversity Officer	Dun Laoghaire Rathdown CoCo	Female	Ecology	Local Authority, policy
4	Project Manager	Woodlands of Ireland	Male	Ecology	Ecology
5	Ecological Lead	Bord Na Mona	Male	Ecology	Ecology, peatlands
6	Research Officer	Teagasc	Male	Ecology, PhD Zoology	Policy research
7	Director	Coillte Nature	Male	Engineering, Environmental Sustainability	Nature, Biodiversity
8	Head of Catchments Unit	EPA	Female	Hydrogeology	Water policy
9	School of Engineering	UCD	Male	Environmental Engineering	Education
10	Senior Executive Engineer	Dun Laoghaire Rathdown CoCo	Male	Engineering	Drainage Division, public sector
11	Environmental Lead	OPW	Male	Engineering	Flood Risk Management, Public Sector
12	Tillage Farmer	Westmeath	Male	Agriculture	Farming - 208ha
13	Dairy Farmer	Westmeath	Male	Agriculture	Farming - 300ha
14	Land Owner	Westmeath	Female	Psychology	Estate Management - 165ha
15	Climate Change Committee	An Taisce	Male	Retired Dentist	NGO
16	Green Party Councillor	Dublin City Council	Female	Environmental Science	Environmental Education, Sustainability Consultant
17	Senior Policy Maker	Department Agriculture and Biodiversity	Female	Agriculture	Policy, Organic Farmer

Appendix 2: Detailed Methodology and Mind Map

In total 17 semi-structured personal interviews with Irish policy-makers, ecologists, engineers, planners, NGOs, semi-state bodies and representatives from farming and forestry organisations were conducted between May and July 2020. The interviewees were identified through personal professional contacts and selected to represent multiple strata of society working in both urban and rural contexts.

The interview design was based around the exploration of four topics: i) the professional background and experiences with land management or land-related policy, ii) the current levels of understanding of the socio-ecological risks associated with climate change and biodiversity loss, iii) drivers and barriers across all sectors to systematically considering nature-based approaches; and iv) current progress towards systems-thinking approaches to combined socio-ecological challenges. The interviews differed in length between 30 and 45 minutes each, and were audio recorded and transcribed.

The study used grounded theory methodology adapted from (Strauss and Corbin, 1996) for the analysis of the interview material (Fig. 1).

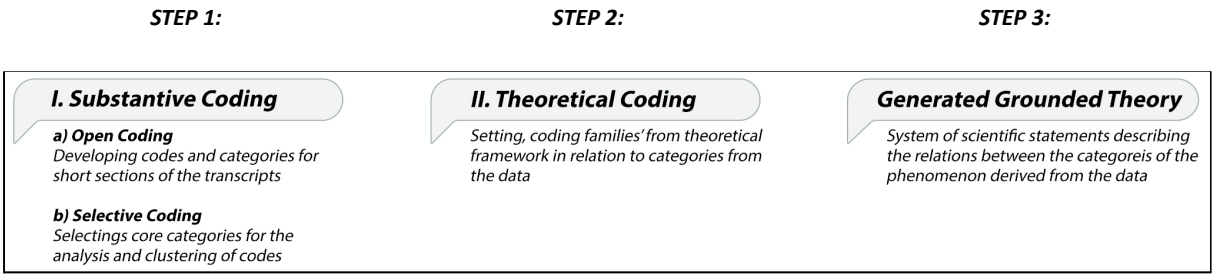

Fig. 1: Coding process and data analysis using the grounded theory approach

Step 1: Substantive Coding

The transcripts were coded using NVIVO in order to collate thematic areas such as socio-ecological issues in Ireland, progress towards environmental challenges at policy level, knowledge of NbA, attitudes both positive and negative, understanding of risks and benefits, and systems-thinking and collaborative skills. The open coding process is depicted as nodes in a mind map in Fig. 2.

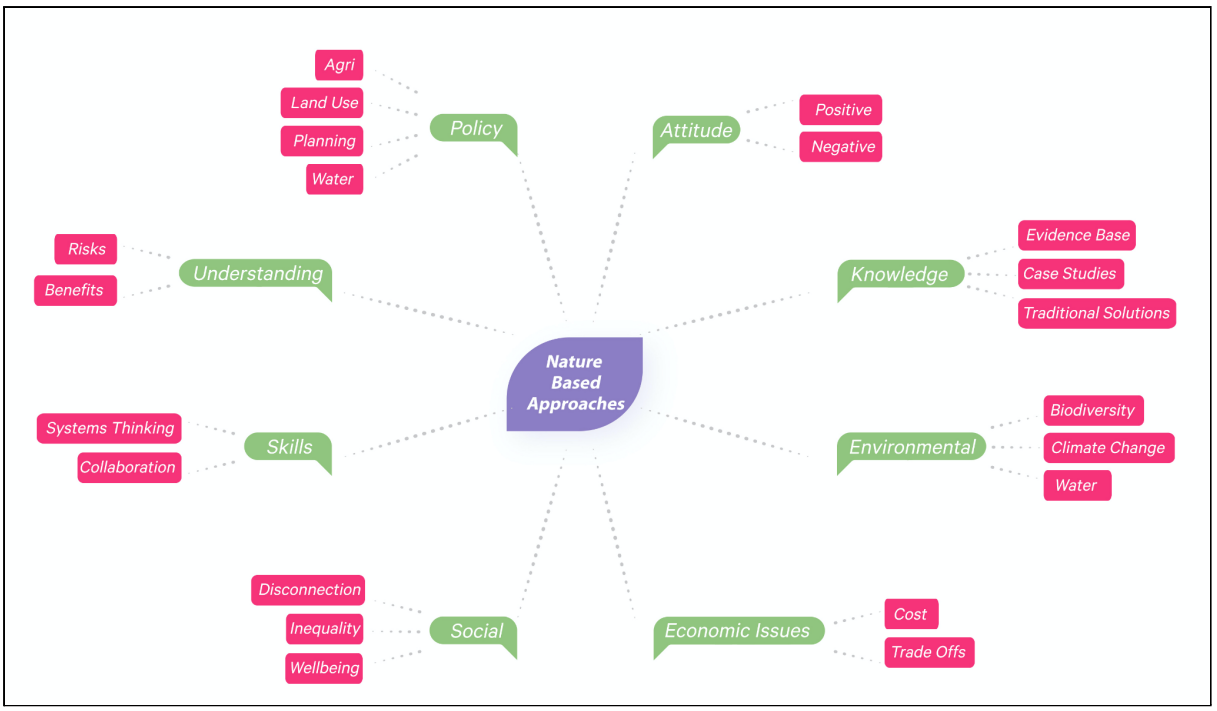

Fig. 2: Open coding nodes and clusters in NVIVO

Step 2: Theoretical Coding

In a second step, an exploration of the transcripts was undertaken and applied against the theoretical framework derived from Biesbroek et al (2014). This framework consists of the recognition of different impasse mechanisms arising from governance processes in the application of natural hazard management.

As mentioned in the introduction, mechanisms are understood as patterns of interaction between actors that bring about change in the governance process that lead to policy impasses. The identified mechanisms are the risk-innovation mechanism, the frame polarization mechanism, and the conflict infection mechanism. The interview transcripts were scrutinised to reveal examples of either real-life experiences given by the participants where the mechanisms were apparent - or in perceived/ conceptual scenarios given as examples in response to interview questions. Impasses are patterns of behaviour in individuals or groups that cause novel interventions to fail. However they are not a stalemate where nothing happens, rather a situation where interactions continue, or even increase, but the project or process does not continue or develop. The impasse mechanisms are outcome patterns of behaviour as a result of various triggers.

For this reason, the data analysis sought to find evidence of the impasse mechanisms being either triggered via certain actions or perceptions, or avoided through different approaches and collaborative efforts. Descriptions of the governance failures that triggered various impasse mechanisms from Biesbroek et al. (2014) were used to devise a set of keywords that helped us detect the parts of interviews where interviewees were talking about societal dynamics that could be likened to these mechanisms (Figure 3).

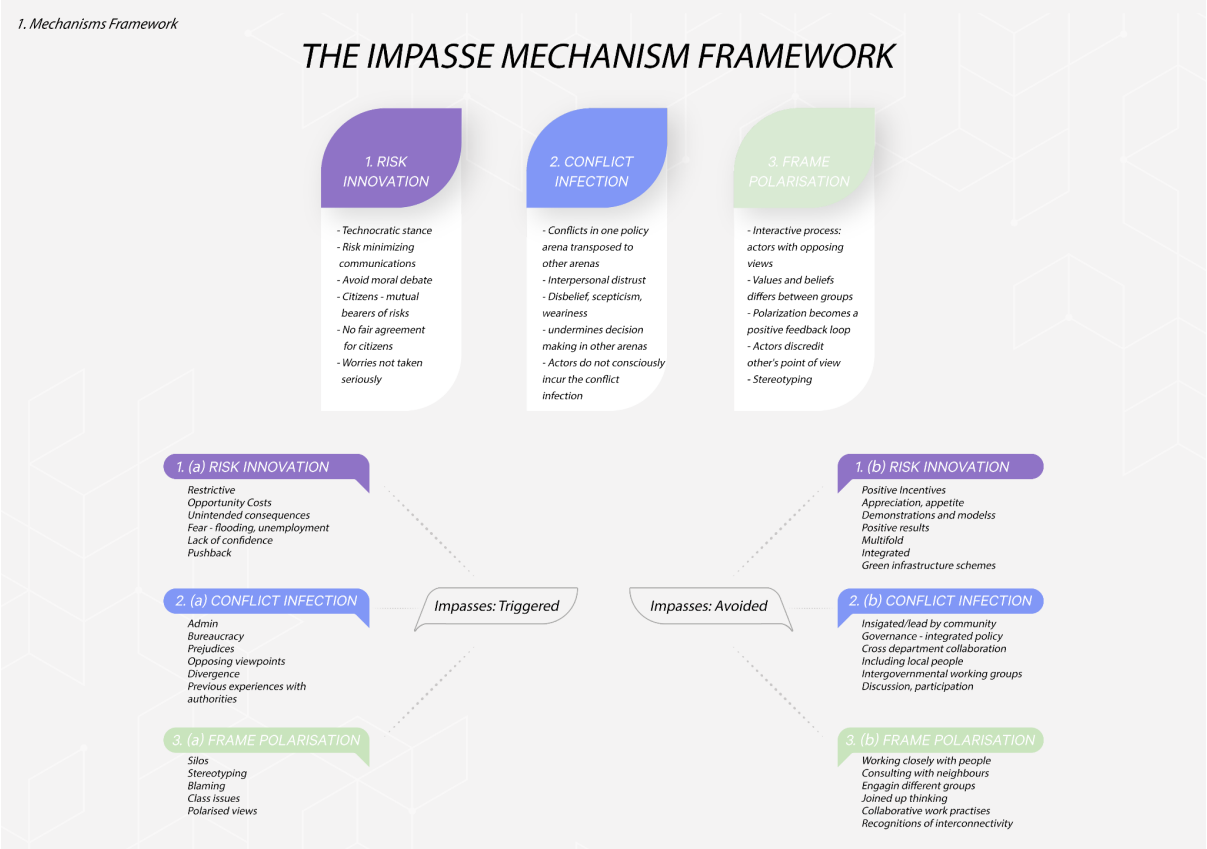

Fig. 3: The impasse mechanism framework (adapted from Biesbroek et al. 2014).
The keywords in boxes 1,1a and 1b were used to detect the risk innovation mechanism, the keywords in boxes 2,2a,2b were used to detect the frame polarization mechanism, and the keywords in boxes 3,3a,3b were used to detect the frame polarization mechanism.

A final step was to generate quantitative data from the analysis of the transcripts. Examples of the mechanisms - both actual examples from participants' own experiences, and conceptual or perceived examples given to illustrate the respondent's thoughts - were grouped together so as to understand frequency of occurrence and to facilitate comparison. The quantitative data when presented graphically allowed for an overarching narrative - a grounded theory - to emerge.

APPENDIX 3
Identified Impasse Mechanisms - Triggered - Irish Practitioners Examples

White = Conceptual	Yellow = Actual

TRIGGERS		
Risk Innovation	Conflict Infection	Frame Polarisation
INDICATORS: Technocratic stance Risk minimizing communications Avoid moral debate Citizens - mutual bearers of risks No fair agreement for citizens Worries not taken seriously	INDICATORS: Conflicts in one policy arena transposed to other arenas Interpersonal distrust Disbelief, scepticism, weariness Undermines decision making in other arenas Actors do not consciously incur the conflict infection	INDICATORS: Interactive process: actors with opposing views Values and beliefs differs between groups Polarization becomes a positive feedback loop Actors discredit other's point of view Stereotyping
FARMER / FORESTER A farmer might see NbS as restrictive to their day to day operations A forester might see NbS as not being able to plant an area. We should be able to incorporate delivering for nature through our land management policies It is difficult to find a balance	DAFM The Dept of Ag have been willing to work with nature But it seems that when scaling up, one hits boundaries or limits Need a way of dealing with the admin and **bureaucracy** behind these schemes We would probably be able to deliver a lot more I think there's a few people, or roles that aren't filled That might bring the capacity from both sectors Draw them together and align their individual policies better I think that's currently missing, so there's gaps between how the various entities are operating	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY For far too long we operated in silos with quite strong individual remits We come to the same issue but from very different perspectives I'm in a "nature conservation" silo where I'm working with a farmer who's in agricultural production. We have very different objectives but there should be a potential to find a compromised position that delivers more for both without impacting on the other. We're at that stage where there is potential, but the actors are still very much bound by their individual remits It seems that the policies that are underpinning the different remits haven't changed enough
LOCAL AUTHORITIES / PUBLIC In urban areas, we are very tight on space A lot of the solutions and infrastructure that goes into developments ends up in our green spaces There can be an over reliance on green space for attenuation, etc. Sometimes in conflict with trying to provide an open space for people to use It depends on the expected frequency of flooding, some ground might turn out to be wet more often That might have implications for public use of those areas	LAND USE POLICY The problem in Ireland is around property ownership, the law of the land, who owns what - that's creating barriers You have to spend enormous ridiculous amount of money to buy the bit of land that you need to do something The state should intervene in that, otherwise it shouldn't be too expensive, relative to other things I think the state should realise that a little bit of money towards certain projects will do an enormous amount of benefit, compared to spending a lot of money on something that may be very limited in terms of output.	LOCAL / NATIONAL In Ireland we need to de-centralise everything. There are big, national issues that needs to be dealt with and give policy and framework But at local level, NbS are flooding issues, or coastal issues. On a national level, there might be policy for NbS, but on the ground you realise that committees can find the best NbS for their needs.
LANDOWNERS You have to deal with a culture shift, especially with land owners There's an **opportunity cost** in their mind So you've got to get over a culture hurdle there Nature based farming where **you're paying people for the ecosystem services** other than producing food You've got to get buy in from that, and that's a problem, not just with farmers it's also a problem with our policymakers because they cant see it Its the same with our foresters, because they cant see it either a lot of the time	DAFM / LAND USE POLICY I was advocating recently that the programme for government, within the new rural development program - That a panel of ecologists working in all the different areas, whether it's grasslands, woodlands, wetlands Should be consulted as to how to pay farmers to manage habitats and ecosystems and restore areas And be paid to do it We're not there yet **In the policy area they're not actually accessing the expertise.**	ENGINEERS / ENVIRONMENTAL SCIENTISTS Engineers have a particular way of understanding the words, largely in measurement and numbers and boxes etc. As ecologists, we have a softer approach to everything, not as exact. So if I ask for a wetland or whatever as part of the development, sometimes the engineers struggle with trying to balance the question of flooding and measuring flows of water - pipe versus a wetlands. How that works and how well it works NbS, we do need more case studies and more monitoring of these so that we have that information fed back into the system So engineers can become more confident about what works and what doesn't
LANDOWNERS But the native woodland scheme you can get your grants and premiums but you cant get much commercially out of the timber So they cant leave that to their children There is an element to that which hampers the uptake Continuous Cover Forestry But it was a hard sell **because we don't have a forest culture**	PERCEPTION OF FARMERS With NbS, people think that farmers are the custodians of the countryside Trouble is, when you drill down into that, what does that mean? The truth is that we're disconnected from nature, both urban and rural	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY I still think we're still not integrated enough We still need to be joined up For example in farming, in relation to CAP and subsidies and unfortunately farmers are still being incentivized to remove hedges. What I would call nice habitat they would probably call unproductive areas To try to make them more productive because if they're not productive, they're not going to get a subsidy for it That area, if it isn't productive, is a potential wetland. It's organic rich soil. It is important to think about our ecosystem services There is just one example But we need to stop that - incentivizing farmers to replace and reclaim that land, to try to make it more productive
LOCAL AUTHORITIES Local authorities still have to be convinced that NBS are going to work, particularly in relation to treatment of wastewater Does it only work for a certain period of time and then the nutrients start to flow through again? We need more research to be able to demonstrate what works You have to take a **flexible adaptive kind of approach to management and development** and be able to adapt further down the line if something happens **There's always going to be unintended consequences with NbS** You do something, it affects something else you didn't expect - being able to adapt to that	PERCEPTION OF BNM Issues along the Shannon in relation to flooding **BNM were considered to be part of the problem there** Our bogs and the lost peatland habitats that would have helped with that flooding issue If we still had those bogs, they would have been able to retain some water that would have alleviated the flooding	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY Farmers have to put food on the table as well But it just seems to me that we're incentivizing farmers to grow beef below cost You're being very productive doing that But that's having these unintended consequences of all these negative impacts. Trying to reorganise that and switch it around So the same sort of resources are flowing through our local communities, but incentivizing these more positive, more sustainable land uses So instead of having those farmers spreading fertiliser They would be maybe grazing less or trying to manage so its a bit better, a bit more wetter, a bit more biodiversity friendly.
LOCAL AUTHORITIES Bogs in the Shannon floodplain, they're basins, so they could fill up with water. Several different organisations looked at that to see if we could use bogs to manage flooding events But we would have to keep them empty of water, for a potential flooding event That would mean a lot of pumping and a lot of energy, a lot of resources. So that's an example of while the rewetting of peatlands will be part of the solution it's not going to be the complete solution.	PERCEPTION OF BNM We have a lot of history in Ireland **Turf cutting is a very emotive subject** It is a difficult subject in relation to consider potential regulation We haven't dealt with it very well Lots of people come to it with a lot of very strong opposing viewpoints	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY There's also divergence between agricultural policies From a farmers point of view, they're being incentivized to remove some habitats They're deemed ineligible for single farm payment On the other side environmental people are telling them to retain these habitats Because they have a high ecosystem services associated with them

APPENDIX 3
Identified Impasse Mechanisms - Triggered - Irish Practitioners Examples

White = Conceptual	Yellow = Actual

TRIGGERS		
Risk Innovation	Conflict Infection	Frame Polarisation
POLICY MAKERS Challenges are more to do with the economic systems that we have with manmade solutions, they're very defined You have an asset base, you can create legal structures around it Tends to be very concentrated in the hands of a few - large contracter or large landowner It's very well understood Nature based, it's going to require us to kind of rethink or reinvent ways of doing this Because they'll probably be way more dispersed, lots of different actors involved, they'll be more flexible **Nature is not black and white**, so there will be lots of grey in it, and you have that kind of flexibility Also you don't have that real reductive thing where you push you pull one lever and you get this reaction It'll be more iterative You need to respond, try things that are not working, try something out so to be more flexible So it requires a different way of thinking about things.	DAFM / LAND USE POLICY Divergent policy Policies to promote greater planting of coniferous forest Enhance carbon storage Frequently targeted to high nature value areas - areas that are high from a biodiversity point of view Not necessarily designated under Natura 2000 or SACs or SPAs Leitrim - very important from a semi natural grassland point of view These grasslands are being lost and the biodiversity associated with them are being lost Because they're being targeted for afforestation.	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY Native woods that you plant will take such a long time to mature You probably in your lifetime won't get the value for timber A farmer might say; I could do this but I probably won't get any benefit from it Might go with fast rotation commercial crop of timber instead Commercial versus non commercial - probably go commercial There's also a kind of conservatism in farming where farmers in Ireland don't really connect with forestry Certainly not in the same way they would in continental Europe In Ireland forestry is considered to be a separate thing from farming
POLICY MAKERS Usually if there is a pushback it's more to do with the practicalities or logistics of getting something done, within the existing policy framework, so that's usually only where the difficulties are. It's either that or it's funding.	DAFM / LAND USE POLICY We just allow people to do whatever they want to do in certain areas. I'm not talking about micromanaging/ showing up and telling people. We should have landscape level planning We should be saying we'd like more tree cover native species in the uplands, or west of the Shannon, or this part of the country is primarily for that We should basically be deciding at a high level, what we'd like the country to look like in 30 years time, or in 2050 Then that should feed our plans and policies.	FLOODING / ENVIRONMENTAL SCIENTISTS There is a lot of public concern about flooding There is money to prevent flooding There is an acknowledgment technically that these kinds of solutions won't prevent the loss of life that some of the flood money goes to You can't get away from maybe some hard defences In terms of protecting from loss of life etc But there is an acceptance and acknowledgement that these types of measures can help with your smaller and irregular floods And that they have multiple benefits in terms of water quality and biodiversity So there is potentially an avenue there as well.
LOCAL AUTHORITIES / PUBLIC NbS aren't going to necessarily solve all the issues They sound fantastic, a logical, common sense thing to do But they're not going to achieve everybody's outcome We're at the early stages of acknowledgement and acceptance of these as a way forward We have to manage the risks People see them as a panacea to all ills, but in the coming years we might not achieve that Then people lose interest, it's too hard	DAFM **Our big challenge is to convince government departments to think that way** We're trying to encourage it, and advocate for it Bring the science forward that shows NbS is a good idea But ultimately you need policymakers to think outside their policy box We've succeeded in principle with the water policy makers **But we still have to tackle the agricultural policy makers** Forestry policymakers are really on board - but there aren't really practices in place at the moment to deliver on that It's about trying to join up the thinking	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY You see an overgrown area or something You used to see it as scrub, kind of waste land, as well Now my own attitude has changed, I see that as kind of very positive That it's important to retain For the average farmer, they have a gra for the land But actually they want to see lovely green grass, and highly productive field The temptation is to send the digger into the corner of the field to move all the shrubbery and clear up the area Get it all when cleaned up so that you can graze more grass I think there's a confusion There is a gra for the land, a lovely picture of the land with big open green fields, lovely grass But from a nature point of view, a gra for the land will actually mean it'll be wild
LOCAL AUTHORITIES / PUBLIC NbS are harder to quantify The OPW implement a lot of flood relief schemes For the most part, those comprise of flood walls, barriers in towns Engineers can calculate quite easily, or with some confidence, what a predicted height will be in a river channel They trust that system of work The alternative to building those flood walls is to incentivize farmers to put in small barriers or dams in their drains, upstream in the catchment Harder to quantify that, harder to have confidence in it	PERCEPTION OF DEVELOPERS It has to come from the local authorities and the planners To be really specific about what we want schemes to provide We need some kind of appraisal To see are these schemes delivering on what they were promising As long as there are loopholes, or grey areas in the requirements Then that's just something that developers are going to exploit It's just the business they're in	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY They're convinced that Ireland's cow population is more or less responsible for the ice caps melting and global warming and everything else It's not Its fossil fuel, that sort of crap that's causing the problems I think we can go down the road that every cow has to be slaughtered You're only allowed to go out and milk two or three cows I don't know why I'm standing up for the dairy farmer That's where I feel things will go The general public aren't science based That is a real fear Like our friend in America, fake news I suppose.
LOCAL AUTHORITIES / PUBLIC Nature based Solutions, unlike hard engineering solutions, require a lot of ongoing maintenance We're finding that the commitment isn't there We put them in, and walk away thinking that'll look great The initial pictures on day one, lovely planting, reed beds and so on Ten years later, they're now presenting themselves as a lot of operational issues and maintenance issues. That is one of the issues we do really need to get on top of The ongoing operational maintenance	CROSS DEPT Why not have a national policy? We even have the perverse situation where we conditioned green roofs on some of the Dept of Education buildings The Department brought us to ABP to object to us conditioning them to put green roofs on their school buildings So one arm of government is pushing the climate change agenda And the other arm is saying we can't afford it Take off the green roofs etc. **There's mixed messages coming from the highest levels**	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY There's very little collaboration The dairy farmers in the discussion group would look on nature, or people that are environmentalists As not mainstream They'd see them as being a bit alternative So, thats a gap that needs to be bridged
LOCAL AUTHORITIES The operational maintenance The initial cost - not all the time - but sometimes the cost can be seen as an issue Does require a lot of land, to have a properly designed and integrated Nature based Solution I think at Local Authority level, it's primarily the ongoing maintenance. Even permeable paving - we're requiring those on some of our development schemes A lot of permeable paving is on the roads, within their functional area Once we specify the roads dept are concerned with who's going to maintain them They don't have the skillset or the equipment to go out and start cleaning the gaps between the permeable paving blocks So they don't want them, they want the traditional solutions So maintenance is a key issue	PERCEPTION OF ENVIRONMENTALISTS My one fear, would be the fact that the green party are in now That always worries me slightly I do like to have one or two greens in Because it just keeps manners on everyone else Which is a good thing	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY They're taking a number of farms and asking them to do it Things like plant wildflowers along hedgerows and stuff like that There's a couple up the road, they're the big consultants in that area But they're a very alternative couple I don't think farmers are going to listen to them They know what they're talking about, they know what they're doing But their appearance and their approach is probably not what the farmers are going to listen to So they need to get a recognised sports person or somebody like that To be actually promoting this thing Rather than some alternative ponytail person coming around

APPENDIX 3
Identified Impasse Mechanisms - Triggered - Irish Practitioners Examples

White = Conceptual	Yellow = Actual

TRIGGERS		
Risk Innovation	Conflict Infection	Frame Polarisation
LOCAL AUTHORITIES / PUBLIC Despite everyone being supportive of NbS, they don't seem to solve large flood events So we would feel that we're in a difficult position Kind of between a rock and a hard place. In one way you want to approach a more integrated catchment approach But people still demand the hundred year flood defence That's the kind of level of comfort people want to live in their modern home And actually we can't seem to achieve that by NbS So we end up building kind of walls or structures Irrespective of what we do upstream to try and slow the flow.	PERCEPTION OF LOCAL AUTHORITIES Interaction with local County Council, local authorities Only as inspectors come out For water quality tests etc But it needs to be done more on a softly, softly approach Rather than coming threatening you with fines and everything else It's fairly heavy handed when they do come out It would work much better if it was a joint effort Rather than top down That would be the only dealings with the council really	ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY My experience of talking to my friends who are intensive farmers I don't get the feeling that they've been in any open dialogue The subject of environment and how they can improve I had a conversation with a friend of mine who is an intensive farmer His attitude was, let's get more intensive I find it really depressing to hear that He feels he's had no engagement with anyone I think it'd be more one to one, to change those views or groups Rather than an aggressive movement Doesn't necessarily always seem that well thought out We're talking about people's livelihoods
FARMERS They're trying to ban it (Roundup) The chemical companies are only getting a year or two licence each time now In my opinion, is a very (efficient solution) The amount of things you'll have to use in the absence of it, would cause more of a carbon footprint, more of a problem, without a shadow of a doubt I mean the world has to be fed I think a happy medium has to be drawn We're trying to improve the whole time But the Roundup thing is an issue I think its going to cause more problems than it's going to solve But the green crew really seem to have it in for glysophate	PERCEPTION OF LOCAL AUTHORITIES I found them (Local Authorities) incredibly unhelpful if the truth be told Leader is helpful, but there are so many hoops that you have to jump through To actually get something done I haven't found it very helpful I haven't pursued it in the last number of years But previously I did, I suppose about four years ago I didn't find them very helpful	TURF CUTTING / NGOS One immediate problem is the people cutting turf. We've been doing this for the last 6,000 years Doesn't make it right! Could have been doing the wrong thing for 6,000 years We have to approach that because it is a problem, closing the peat-fired stations Which we've been advocating We're very involved in the court case etc We were very pleased, but obviously the workers weren't quite so happy But the annoying thing about that is, people tend to turn around and blame the NGOs In fairness, not many did in this case, but they should blame the government! They've been told that its not sustainable, we cant carry on doing that, the value of the wetlands is too great This is far too inefficient of a way to get your energy We'd be much better using wind, wave etc We'd be better off burning coal than peat, for Christs sake. Its about the worst thing we could burn We've been saying that for 20 years Its not good enough then, when a court case arises and its been closed down To turn around and start blaming the person who warned you about it in the first place But who said life is fair
FARMERS Production in terms of the level of nitrogen that can be used on the dairy farm Means the stocking rate, the number of cows per acre or per hectare can't be as high That reduces the output per acre or hectare Means that they're spread out more, which means the unit becomes less viable As you reduce output, but you still have the same number of animals to feed Either that or you have to rent or lease or buy more land around you. So if you reduce the stocking rate, I think you'll end up with people being let go More unemployment for dairy farmers because they won't be able to afford to employ somebody If their system is not as efficient as it is at the moment.	CROSS DEPT A good example of this not happening is the river Shannon You have OPW, Waterways Ireland and the ESB Various people poking the nose in for that whole river basin area It should be one one authority doing that For proper joined up thinking, integrated thinking - not silo thinking Although I think it has improved, that's one obvious example of where it needs to improve	FARMING COMMUNITY / POLICYMAKERS We're in a situation now where we cant continue with the intensive carbon intensive farming practices that we have globally Particularly in Ireland Agriculture in particular is one of our biggest emitters The farmer is going to need support in diversifying To me that's that's where we need to start straightaway Looking at how we can support farmers in moving away from beef and dairy farming So forestry for example, or rewetting bogs or building wetlands All those different types of options that can create employment as well We have to ensure that it's a just transition That we're supporting Bord Na Mona workers, for example Providing alternatives for them To me, that's probably the first thing that we really need to do To rebalance where our money is going through revising the National Development Plan.
FARMERS I can only speak for dairy farms really Dairy farms have gotten very intensive, monocultural On dairy farms you don't keep anything else You keep cows, in actual fact I don't even keep the calves Whereas, if you could re-introduce the back to back, a bit of this and a bit of that When I was growing up, we had a bit of a corn and a few pigs and a few sheep, and a few cows Everything was working more in nature, than it is now But to do that, you'd need to get more for the food Prices are going to have to go up That's the crux of the whole thing It's easy to go green if you're not trying to make ends meet	PERCEPTION OF FARMING If people are stuck in a rut, where they don't value time, some people don't Some farmers are very concerned if not working 12 hours a day They feel they're not a proper farmer Theres that narrative - the harder you work, the better you are In fact that there's plenty of people in the sector not seeing their kids growing up That's sort of a regretful thing But I think at the moment there's probably not enough people on the ground to be able to share that knowledge It's still sort of a niche thing That's probably across the board So I think if we can support the people who are utilising nature based solutions We'll get more uptake	PUBLIC / POLICYMAKERS It's a very easy narrative for people to assume that environmental issues and climate action is a middle class problem and needs a middle class solution, which is absolutely not true Because nobody will be unaffected So actually, we need to make sure that whatever measures we are taking are very equal From a social perspective as well So things like carbon taxes are very controversial But if we can introduce that in such a way where it isn't tax that just goes straight back into the Exchequer That instead it would go back into retrofitting programs Which makes people's houses warmer, safer, drier, and cheaper to them in the long term So people are seeing a social and financial gift back from it We need to work very hard on changing the conversation around it
LANDOWNERS Disbenefits with NbS - I think financially it can be a disadvantage Also sometimes the lack of business opportunity that can potentially arise It's sometimes hard to do both		INTER-DEPARTMENTAL I don't I think there's a lot (of collaboration) especially within agriculture I think it's still very compartmentalised I don't think they interact so much and they should be I think that whole link between environmental health and human health even isn't made We're talking about this one health vision It's all nice words But on the whole, it doesn't really happen Worldwide we've issues with malnutrition and yet in western world it's over nutrition and obesity People say we aren't taking enough exercise and we're eating too much or eating the wrong stuff And that is the case, but we don't seem to do much about it We tend to ignore it in a way Even in Ireland we have an obesity crisis, one out of every four kids is obese or getting there But nothing seems to change

APPENDIX 3
Identified Impasse Mechanisms - Triggered - Irish Practitioners Examples

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TRIGGERS		
Risk Innovation	Conflict Infection	Frame Polarisation
LOCAL AUTHORITIES / PUBLIC As a society, we've come very accustomed to being very nice and tidy Which goes against principles of biodiversity and nature based solutions What we're seeing in the city at the moment We've been trying to move away from using Glycose Phosphate for treating weeds in the city We went back to more natural processes last year But we simply don't have the manpower to keep up with it So if you walk around the city at the moment, there's grass verges nearly everywhere Because of the particularly warm and wet weather we've had they've just been like blooming So now we're getting complaints all the time that the city looks really unkempt		ENVIRONMENTAL SCIENTISTS / FARMING COMMUNITY A certain sector of tillage growers who min till or zero till They don't plough the land But they need to use some glyphosate, for example roundup To spray it off initially, but they don't plough Whereas a regular tillage guy will spray it anyway and then plough And then another spray, and then another Whereas these guys they minimise the spray they use They're conscious of the soil integrity They don't want to keep turning over Ultimately you're just turning it over and turning it back every year, makes it unstable But the diehard environmentalist are against using glyphosate Even though they're using less Sometimes we get stuck in these polarised views
FARMERS NbS might be perceived as potentially costly work The perception will be that there'll be reduced output Farmers automatically assume they will have less X to sell (whatever they're producing) That narrative grows legs My husband is an inspector for the organic trust He's never met an organic farmer who's been critical of becoming an organic farmer They're all quite content None of them are saying oh geez I wish I didn't do this is, its just not good at all Yet the negativity towards organic farming comes from the intensive conventional side		

APPENDIX 3
Identified Impasse Mechanisms - Avoided - Irish Practitioners Examples

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AVOIDED		
Risk Innovation	Conflict Infection	Frame Polarisation
INDICATORS: Technocratic stance Risk minimizing communications Avoid moral debate Citizens - mutual bearers of risks No fair agreement for citizens Worries not taken seriously	INDICATORS: Conflicts in one policy arena transposed to other arenas Interpersonal distrust Disbelief, scepticism, weariness Undermines decision making in other arenas Actors do not consciously incur the conflict infection	INDICATORS: Interactive process: actors with opposing views Values and beliefs differs between groups Polarization becomes a positive feedback loop Actors discredit other's point of view Stereotyping
FARMERS One way is to try positively incentivise In relation to better, more sustainable land practices A good example is the biodiversity and farming projects that have been carried out in the past few years One would be Kerry Life I think they are incentivizing farmers to block drains, to have positive downstream impacts on the freshwater mussel. It's that sort of thinking, that's great for the footprint of a project I'm in Laois and we don't have a project like that here **We need a project like that in every county, and then we need to expand them.** We're incentivizing farmers to block drains to be a bit more sustainable, maybe a bit less productive for water quality and so on But the key thing is we can't leave farmers behind Or those land managers - that's the difficult part.	COLLABORATION: FARMERS / ENV SCIENTISTS The Bride EIP, which is headed by farmers But it's being supported by research advice and policy.	ENVIRONMENTAL SCIENTISTS / LOCAL COMMUNITIES A sub-catchment approach, rather than a broader view on the landscape. Target resources at a specific sub-catchment For example, Bundoora catchment in Leenan, probably the best pearl mussel habitat left in the world Take that sub-catchment, and direct resources at that **Start at the bottom** and bring along everybody who owns land or has an interest Not that many - 25 / 30 people max Use as an example of how you tackle NbS and real sustainability in that situation Work closely with those people Explain what you're trying to do, and how you want to do it
FARMERS Bride EIP, there was room for about 40 farmers in this scheme But about 80 farmers applied for it We couldn't accommodate the amount of farmers who were interested There were farmers who are willing to be part of the scheme Even if they weren't going to get paid to be part of it That shows the kind of interest - these are intensive farmers Shows the kind of appreciation and appetite. We're seeing more and more appreciation and an appetite But **we need to start incentivizing or paying for some of these services** Or some of these nature based solutions.	COLLABORATION: INTER DEPT @ NATIONAL LEVEL In terms of governance structures, integrating policy Policymakers speaking to one another in different departments I think we've come a huge way in the last 10 years We have structures in place now But it's just a little too early to have seen the outcome of everyone working together But certainly the working together has started.	BNM / LOCAL COMMUNITIES We consult with neighbouring landowners We work with them particularly if there are issues We can't we can't just work in a vacuum We work in a landscape with neighbours and particularly with hydrology - you need to be cautious. If we do something on our land that can potentially effect upstream, you have to be very conscious of that Sometimes that means we've had to adapt our rehabilitation plans for example In some places we haven't been able to block drains because if we had we would potentially flood upstream
LANDOWNERS / FARMERS None of this will happen unless landholders buy into it One of the things we have in place at the moment is an EPA funded research project called slow waters Putting in place demonstrations and solutions on three farms in the south of Ireland They're modelling up proper NbS There'll be demonstration farms for people to go and see what these things actually look like, how you can still farm with them in place People can get a tangible idea of what they are.	COLLABORATION: LOCAL COMMUNITIES / ENV SCIENTISTS / POLICY MAKERS Through the water policy we've been quite strong advocates for taking an integrated catchment management approach Using the catchment as the as the framework Implementing water measures within that framework across all sectors at once Including community groups We now have our new community water officers We have low catchment assessment teams who are going out finding local problems and getting local solutions to those problems. We have our national technical implementation group And a whole raft of other governance structures which are about bringing together the policy to address water issues. That process is really only probably five years old But we have started to bring the catchment based thinking into the water policy And that's really set a strong foundation now for taking the next step, which is the multiple benefits bringing in biodiversity, climate, flood Because all of those also hang off a catchment based approach, as well So an integrated catchment management approach.	BNM / OTHER AGENCIES We do a lot of engagement with a lot different groups We're on local authority and biodiversity heritage forums, that deal with LA heritage plans That would include biodiversity and also include climate action Sometimes it's overlapping and sometimes it's repetitive It's trying to get a bit more joined up. A great organisation now is the Irish Forum on Natural Capital BNM have engaged a lot with them in recent years BNM is also on the Peatlands Council We are involved in a lot of different groups and organisations

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Identified Impasse Mechanisms - Avoided - Irish Practitioners Examples

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AVOIDED		
Risk Innovation	Conflict Infection	Frame Polarisation
DEVELOPERS In fact that's already a key part We're compelling or requiring developers to use nature-based solutions To use soft, green SUDS measures They're now overlapping with the amenities requirements in planning applications In some of the green roofs, developers are allowing access onto those roofs Providing the amenity space There is clear overlap, particularly for amenity space Developers are recognising that Some of them are promoting their developments as 'green' etc	COLLABORATION: INTER DEPT @ LA LEVEL In that catchment we're gifted with the natural topography we have so we can utilise that But one of my smaller roles, I've recently been drafted into the Climate Action team So more and more we'll try and seek funding for additional measures Retrofitting soft SUDS measures on existing developments etc. Primarily its driven by our team, and prompted by national guidance and so on But they're generally lower-cost solutions Using the natural, and collaborating with our parks department They're actually coming to us around installiing wetlands in here We're planning on flooding that area during a 100 year event so this will work very nicely We're pushing open doors with our parks colleagues Its initially driven by our own needs to prevent flooding using these nature based solutions	ENVIRONMENTAL SCIENTISTS / LOCAL COMMUNITIES A really good example of a community who have come together They had flooding issues in the Inishowen Peninsula That was probably the trigger of it but they have a broader mindset than just that. Beyond that, they have good fishing rivers and they are keen on biodiversity They managed to bring over the river restoration centre from the UK to run local training courses Farmers are all involved and they've got some demonstration sites that they're planning on putting on in the coming months With farmers on board There's definitely more gains to be made through the community water officers structure And the rivers trusts structures
LOCAL AUTHORITIES The Poddle flood relief scheme is a medium-sized flood relief scheme Received a few million, just gone through planning permission there now Timon Park close to the M50 Includes a flood storage solution and an integrated, constructed wetland That's a pretty good demonstration project for OPW and South Dublin County Council Quite a modern approach But the Poddle is quite a small river - basically 1.5 to 2 metres wide Not a huge volume of water And you have a bit of space in Timon park It's hard to get space, particularly in the urban zone It's a good example of what can be achieved in urban environments But it's not typical yet It's more the exception rather than the rule.	COLLABORATION: INTER DEPT @ NATIONAL LEVEL The water framework directive, the agencies involved Working with the Environmental Protection Agency, Department of Housing Fisheries, Forestry A number of working groups So there are intergovernmental working groups So a lot of parties sit at the table There's a lot of discussion going on	ENVIRONMENTAL SCIENTISTS / FARMERS Farmers listen to other farmers Its an evidence base piece that's needed If you can get the leading - there's always, in every group there's leading ones Get them doing it, then the mob will follow So, it's just a case of getting a couple good farmers up and going to work better than anything else.
LANDOWNERS To win, you do that by carrying out the objectives So to get good value for money, say for example in protecting a forest area First you delineate the area Then ask local ecologists, local people What is this all about? what's actually going on here? How does this really work? Model as much as we can in terms of the growth, in terms of productivity Look at products of the forest Take the products of the forest, then we won't be wasting the carbon We will actually be keeping the carbon there And then we look at who lives there How many people live there, what do they do Meet with them to offer them an alternative Also give them enough money to live and give them a sense of pride in their environment Create a sense of community	COLLABORATION: FARMERS / ENV SCIENTISTS NbS will be implemented through discussion groups, information, test trials and general research Teagasc are quite good The CARE group, they do trials We'll be doing various things on our farms and seeing if they work Improving soil structure and so on	
LOCAL AUTHORITIES In Dublin City at the moment we have green infrastructure projects We don't have many at the moment But there's a few more coming on stream We've done some insight studies into northeast inner city and Stoneybatter The positive impacts are multi-fold The visual impact first and foremost Even just planting more trees, or hedgerows, down the middle of a road The visual impact of that naturally changes people's relationship with their physical surroundings and their environment And then on the road in particular, they can act as a noise barrier as well Which makes it a more pleasant place for people to live.	COLLABORATION: LOCAL COMMUNITIES / ENV SCIENTISTS / POLICY MAKERS I think the most important thing is the governance and the structures To get them correct If we go back to the Shannon example You set up one body to look after the Shannon You look internally at all the ecological environmental issues surrounding the Shannon Everything from the fish numbers through to the flooding to everything else Then you would draw up a strategic plan for the area While you're doing this, you involve the local people in this as well Particularly farmers in terms of flooding Speak to the people in the towns that get flooded as well But we're nowhere near that From our point of view, to get nature based solutions going we're really going to need to get a lot of buy in from people	

APPENDIX 3
Identified Impasse Mechanisms - Avoided - Irish Practitioners Examples

White = Conceptual	Yellow = Actual

AVOIDED		
Risk Innovation	Conflict Infection	Frame Polarisation
LOCAL AUTHORITIES Personal gain from introducing those flood defence mechanisms We can see them on the Dodder for example There's been work going on there for a number of years Protecting people's homes But people alos love walking down there We've seen otters and kingfishers down there It's achieving that fine balance And actually, when I think about the budget around those projects It's actually really quite small in the overall scheme of things For massive social and environmental gain But the problem is a lot of those gains are long term People like to see things immediately	COLLABORATION: LOCAL COMMUNITIES / LOCAL AUTHORITIES It's very much a focus of the strategic environmental assessment That participation piece has become much stronger over the last number of years Used more in terms of policies and programs We established social pillars, and PPNs They're represented on our all our policy groups on the council now as well There's definitely there's more voices around tables at the moment Really good to see, because you need different, various levels of expertise involved in making decisions	
FARMERS We have (used NbS) on our farm in particular We're organic, to be honest we were never particularly intensive, or over relied on pesticides We did a little bit, and we used a bit of fertiliser But we found that for the last 8 years For the first few years we were a bit nervous - will the grass grow? Because you're so used to it I can see why its a big decision I was dead gung-ho to convert to organic farming, my husband a little reticent Its a huge decision for farmers to do Because its a real fear You're making a change to your farm, will the grass grow How will I cope with all the weeds? But my husband would now say that we probably grow more grass now than we did before I don't know if that's because we've left the land to do more of its own thing Not that we have, we still farm, we still have the animals, grazing and so forth. We probably farm slightly differently, but we're more in tune with what we're doing. We do less work on the land, so its an easier life for us. So its given us more time, and time is wealth as well, especially with young kids I think that value needs to be put on it as well	COLLABORATION :FARMERS / ENV SCIENTISTS People need to see how it can work Good examples A good sort of knowledge transfer of how it works There's a theoretical side and then there's the real practical side If more people sort of see the benefits For example, on a farm It benefits a farmer in terms of lower input costs and potentially higher profitability But maybe more time	