



EU LIFE FEASIBILITY STUDY

FLAG – funded Cuan Beo project

Final Project Report
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1. Project overview:

NUIG were charged with carrying out a feasibility study to determine the possibility of applying for an EU Life project based in the Galway Bay South East Catchment to connect land and sea. This study was carried out in conjunction with Cuan Beo who are a community-based organisation established with a mission of improving the quality of life, environment, economy and heritage around inner Galway Bay. Cuan Beo currently engage in the development of education programmes, the organization of scientific and heritage events and activities with a particular focus on informing the community of the importance of protecting the Galway Bay Marine resource. Cuan Beo aims to campaign and assist in the restoration and/or improvement of the natural habitat, species, environment and heritage of Galway Bay that is underpinning the economic and social fabric of the district, the recreational amenity it provides and the livelihoods of those who work and live within its catchment. It is envisaged that the potential EU Life project will advance this work and further engage stakeholders in connecting the land and the sea with the overall aim of supporting the local shellfish industry and maintaining/improving water quality in the bay.

Galway Bay South East Catchment Profile (EPA 2018):

The feasibility study focussed on the Galway Bay South East Catchment (Figure 1). This is described in detail in the EPA (2018) Galway Bay South East Catchment Assessment report. The overall catchment covers the drained surface of all streams entering Galway Bay between Black Head to Renmore Point. As such, the catchment has a total area of 1,270 km², with a population of approx. 74,400 and a population density of 59 persons per km². The main urban centres, aside from Galway City, are Athenry, Loughrea, Gort and Oranmore. The catchment basin comprises nine sub-catchments (Figure 1) with 33 river water bodies, six lakes, 20 transitional and nine coastal water bodies and 17 groundwater bodies. There are no highly modified or artificial water bodies in the basin.

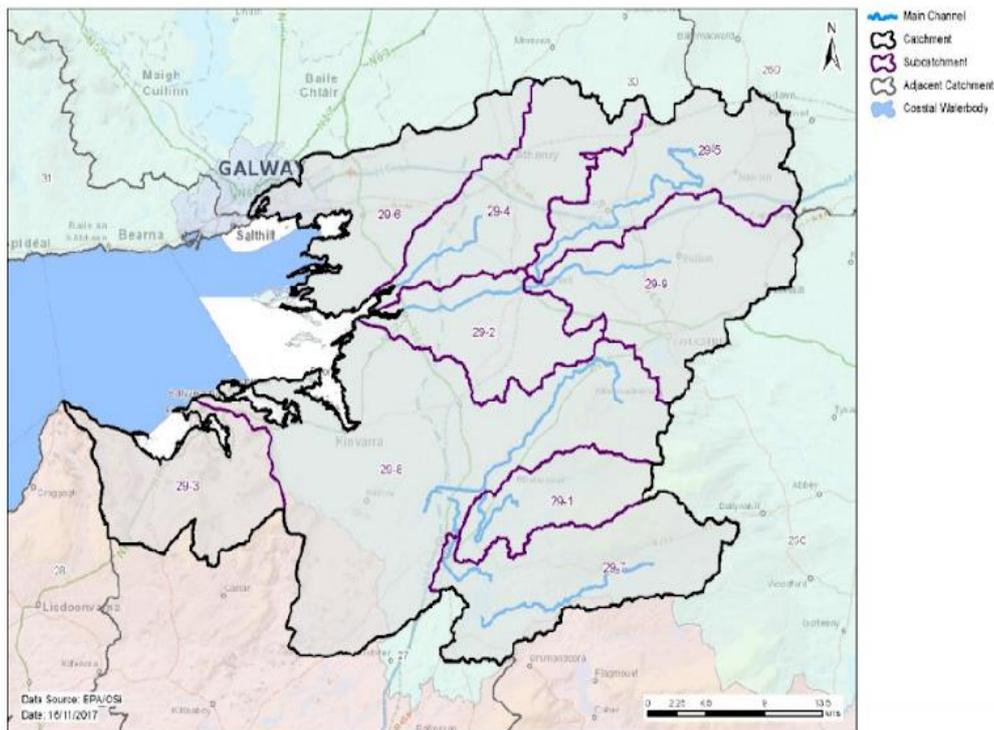


Figure 1. Sub catchments in the Galway Bay South East catchment (EPA, 2018)

In a large part of the catchment the geology is karst limestone, including the northern part of Burren in Clare County. In these systems there are few above-ground rivers, and while there are close links between the groundwater and surface water systems, surface drainage is completely absent in the northern Clare part of the watershed. The southeast of the catchment is predominantly covered with red sandstones, where above-ground drainage is more frequent (Figure 2).

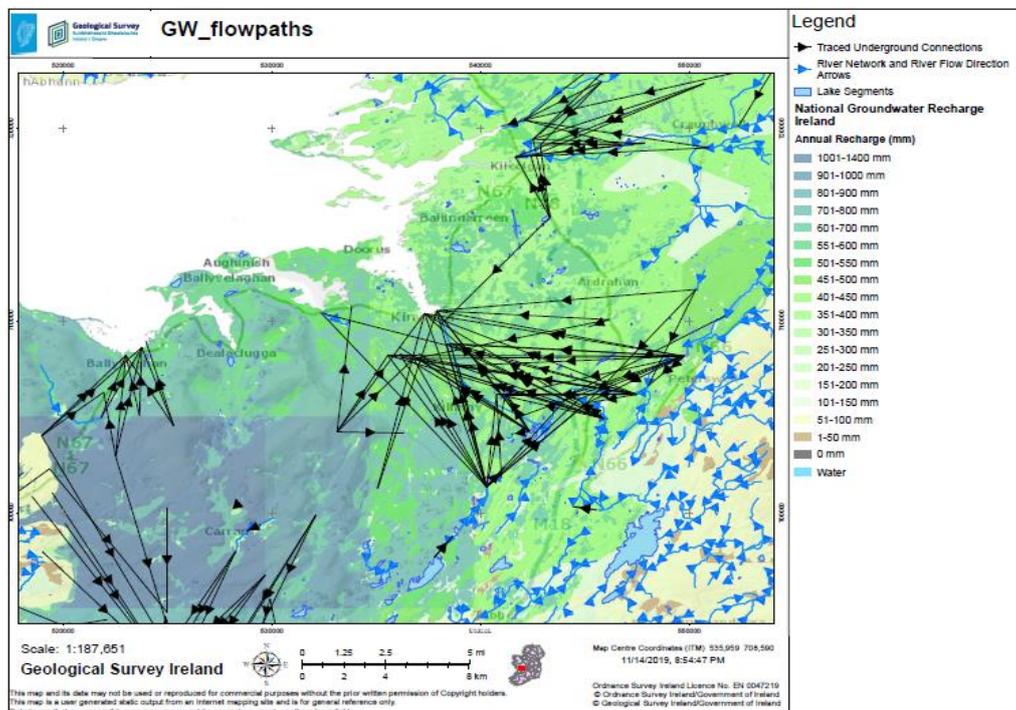
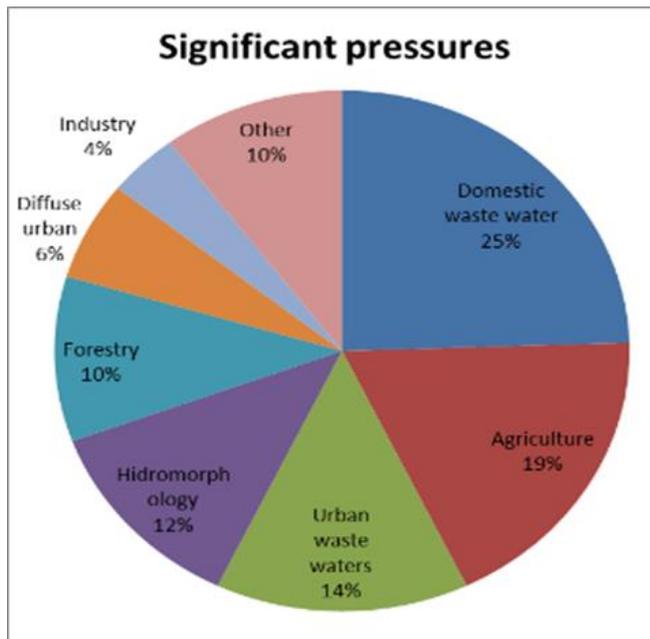


Figure. 2 Groundwater flow paths in the catchment (from GSI groundwater data viewer)

Notably, there are several protected areas within the wider catchment, including Drinking water protected areas, Bathing waters, Shellfish areas and Natura 2000 conservation sites. In the catchment there are 15 group water schemes, seven public supplies, and three other schemes, with a total of 44 abstractions from eight groundwater bodies, one from Lough Rea, and one is from the Cannahowna River. All of these sources were compliant with the standards for nitrate and the standards for pesticides in 2015. There is one designated freshwater bathing water and three marine bathing waters in the catchment, with only one, Ballyloughane beach, failing to meet water quality results. The bathing water profile indicates that the significant pressure is urban sewer outfalls from east Galway city. There are three designated Shellfish Areas in the catchment. Two of the three shellfish areas are compliant with the relevant standards and there are no water quality issues of concern. Clarinbridge/Kinvarra Bay failed to meet its environmental objective in 2015. There are 25 Special Areas of Conservation (SACs), with some of the habitats and species being water-dependent. Hence, 18 surface water bodies, 12 transitional waters and two groundwater bodies have been prioritised for action. While there are seven Special Protected Areas (SPAs) in the catchment, there are no specific water quality and quantity supporting conditions identified in the site-specific conservation objectives for them.

Pressures on waters in the Galway Bay South East catchment (EPA, 2018):



Within the catchment, several significant pressures were identified as part of the EPA assessment report (EPA, 2018). Notably, the most significant pressure that affects the highest number of water bodies is domestic waste water. This is followed by agriculture, urban waste water, hydromorphological pressures, forestry, diffuse urban, and then industry (Figure 3). Groundwater bodies GWDTE Rahasane Turlough and Clarinbridge are primarily impacted by agriculture and domestic waste water. Forestry is the main impact on GWDTE-Caherglassaun Turlough while for the GWDTE-Tullynafrankagh Turlough the significant pressure has not been determined and for IE_WE_G_0117, the significant pressure is an industrial facility.

Domestic waste water has been identified as a significant pressure in seven river, two lakes (Cutra and Rea) and one transitional water body, namely Kinvarra Bay. This is caused by high concentrations of domestic waste water systems in areas of extreme vulnerability, in particular where karstified limestone outcrops are exposed. The Local Authority reported that several septic tank systems failed inspections due to unsuitable soil percolation conditions. Two of the groundwater bodies (GWDTE-Rahasane Turlough and Clarinbridge) are also impacted by domestic waste water pressures.

Agriculture is a significant pressure in seven river water bodies. The issues related to farming in this catchment are diffuse phosphorus loss to surface waters due to poorly draining soils and extreme vulnerability in karstic areas; resulting in excess nutrients causing signs of enrichment.

Urban Waste Water Treatment Plants and agglomeration networks have been highlighted as significant pressures in seven *At Risk* water bodies. These *At Risk* water bodies, with the exception of Kilcolgan_020 and _030, are impacted by WWTPs or agglomeration networks that have capital works scheduled or completed.

Hydromorphology is a significant pressure for six river water bodies within three of the subcatchments which are subject to extensive modification due to the presence of drainage schemes.

Unknown Anthropogenic Pressures have been identified in three transitional, one coastal, one groundwater body and Bunny Lake, which require further investigation.

Aquaculture is a pressure in the transitional water body of Kinvarra Bay.

Forestry has been identified as a significant pressure in four river water bodies and one groundwater body.

Diffuse urban pressures, caused by misconnections, leaking sewers and runoff from paved and unpaved areas, have been identified as a significant pressure in three river water bodies in the Galway Bay South East catchment with elevated concentrations of phosphates and ammonia are the significant issues.

Industry causes elevated nutrients which are a significant pressure impacting Kilcolgan_040.

2. Feasibility Research

Several possible funding streams and project options were assessed as part of this project. One option the feasibility study set out to investigate is the possibility of providing carbon sequestration services through native oyster reefs funded under the Climate Action Sub-Programme (Option 1). In addition to this, the study is further investigating other project ideas and funding stream opportunities, including a catchment-wide water quality project (Option 2) and a native oyster conservation (Option 3).

The feasibility included several research approaches. A literature review including scientific publications, policy documents and grey literature sourced through online search engines obtain other relevant literature, documentation and reports from EU and nationally funded projects. This was supplemented by interviews and surveys with relevant stakeholders in the Galway Bay South East Catchment. Stakeholders involved include members of the shellfish, agriculture and tourism sectors, conservation managers, local authority and research subject experts. Interviews and surveys in particular were used to determine stakeholder interest in and support for a possible project connecting the wider catchment and the sea and into particular project options. In particular, members of the shellfish industry showed great interest in a project connecting their areas of work with the wider catchment, and while there was a general willingness to provide opinions for the feasibility study, there was less interest and support from the farming sector into such a project, with a disconnect apparent in particular between those in the upper parts of the catchment and those in coastal regions. Furthermore, an indicator framework was developed to assess the current situation within the catchment with regard to several factors. The results from all of these research activities inform the proposed project options and their feasibility.

Indicator Framework to assess project options within the Galway Bay South East Catchment

To further investigate the possible project options, an indicator framework was developed to assess the current situation within the catchment with regard to several factors. The framework combines social, environmental, economic and governance factors of the overall catchment to determine what elements a possible project would have to take into account and determine possible project options. Aspects such as the current demographic profile and existing policies/strategies for sustainability were identified as relevant strengths within the catchment.

Multicriteria sustainability assessments can help quantify and understand the real impact of a single activity on nature as well as on society and the economy. It can further help define the manoeuvring space for human development based on the resources available and the capacity for nature to adapt to a certain proposed situation.

This analysis includes the development and applications of models, indicators, methods and strategies for achieving future changes at different levels of the company (national, regional, city, product and individual value chain). Such approaches are relevant for new technologies, solutions and behaviour in different sectors such as energy, production, metal production, transport, marine and maritime activities, waste management and recycling, etc. The analytical methods used integrate knowledge on economics, natural resources and biodiversity, as well as the need to approach and balance different values and interests with the use of multi-criteria decision support tools.

A multi-criteria analysis of the various factors in the catchment is helpful as it can inform the decision-making process. These indicators are contributing to an understanding of the current economic profile of the catchment. The created profile of the catchment illustrates the activities in the catchment and analysis of the economic advantages and disadvantages of different factors. To date, this shows that there are good economic opportunities, a strong agriculture sector and small industries, but shortfalls in some factors relating to tourism (Figure 4).

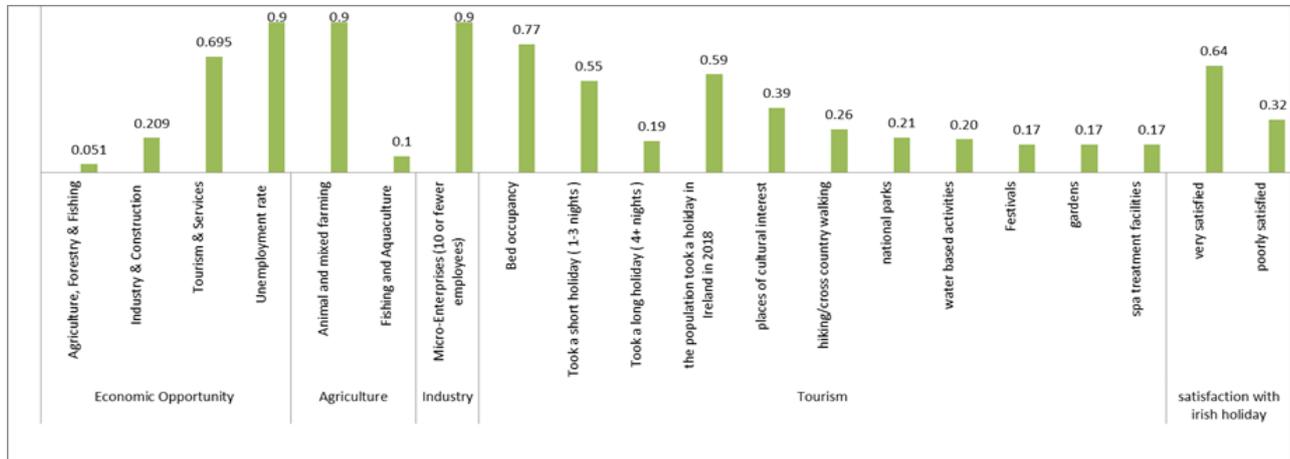


Figure 4: Economic profile of the Galway Bay South East Catchment as per indicator framework

In the assessment, a value of 1 is the maximum value for an event, an action or activity. Multi-criteria analysis is based on the equity valuation through a weighted average, so takes into account the comparison of the different actions or solutions depending on the variety or public policies. The multi-criteria analysis method can be used to determine which solution best suits to the decision makers' expectations. However, for this to happen, a number of indicators and analysis criteria must be determined. In our example, we analyzed the indicators from four different areas, namely environmental, economic, social and governance.

In the example in figure 4, four factors (economic opportunity, agriculture, industry and tourism) were analysed using a series of indicators in each case. For this, the supportability factor described above was applied. The results from the indicator framework have helped guide the stakeholder identification process, the assessment of project options 1 to 3, the identification of possible alternative projects and the identification of additional funding opportunities presented in Section 3.

Option 1: Conservation and restoration of native oyster reefs in Inner Galway Bay to be used as a mitigation tool to take up excess nutrients and greenhouse gasses (in particular CO₂) from farming in the catchment.

Funding stream: Climate change mitigation

The climate action sub-programme supports projects in the areas of renewable energies, energy efficiency, farming, land use, and peatland management. It provides action grants for best practice, pilot and demonstration projects that contribute to the reduction of greenhouse gas emissions, the implementation and development of EU policy and law, best practices and solutions. The European Commission is particularly looking for technologies and solutions that are ready to be implemented in close-to-market conditions, at industrial or commercial scale, during the project duration. The sub-programme also promotes knowledge sharing and integrated approaches, such as for climate change mitigation strategies and action plans at local, regional or national level. Projects receive a co-funding of up to 55%.

Project Detail:

This project would engage with the wider catchment to improve water quality through agricultural improvements against carbon sequestration services provided through the restoration of native oyster reefs. Existing literature suggests that shellfish has the potential to store carbon, the main way in which it sequesters carbon is in the shells of, for example, mussels and oysters (Fry 2012). Shells consist of Calcium Carbonate (CaCO₃) and based on the atomic weight of the elements within Calcium Carbonate, the amount of carbon within an oyster shell can be calculated: Carbon contributes 12g for every 100g of shell equating to 12% of overall shell mass (Hickey, 2009). Fordie et al (2017) propose that subtidal oyster reefs can take up 1.0 +/- 0.4 MgC ha⁻¹ yr⁻¹, however there is no definitive answer as to how much carbon oyster reefs can sequester as it seems to depend somewhat on location, age and management of reefs. They conclude that protection of existing reefs could be considered as one component of climate mitigation programmes focused on the coastal zone.

Feasibility:

A study in Scotland by Fry (2012) sets out that storage figures of 218 kg CO₂-eq per tonne of mussels harvested, while for oysters the figure is 441 kg CO₂-eq per tonne of oysters harvested. However, the same study also assessed the cradle-to-grave carbon footprint of commercial shellfish in Scotland at 649 kg CO₂-eq per tonne of mussels harvested and 1,685 kg CO₂-eq per tonne of oysters harvested. Including carbon sequestration in the harvested shellfish, the cradle-to-grave carbon footprint of the industries is calculated to be 430 kg CO₂-eq per tonne of mussels harvested and 1,244 kg CO₂-eq per tonne of oysters harvested (Fry, 2012). This confirms that shellfish compares favourably against other meat products and as such is a low-carbon food product, and Scottish shellfish has a lower footprint than Norwegian shellfish as calculated by Winther et al (2009), but the industry still has a carbon footprint that needs to be offset before overall carbon neutrality can be achieved and before carbon uptake services can be extended to other sectors such as agriculture.

As the shellfish industry itself has a carbon footprint, offsetting carbon for another industry is not feasible. Before carbon offsetting for another industry can be considered, further investigation is required to determine how the carbon footprint of shellfish harvesting in Galway Bay can be reduced to make the industry carbon neutral before carbon offsetting can be considered.

Alternative Project:

A possibility to consider is a native oyster restoration project to help offset the industries' own carbon-footprint. This will need to be further explored with possible project partners, for example BIM and MI, to ensure a collaborative effort and prevent duplication. Such a project could be suited for the EU Life Climate Change Mitigation or Environment and Resource Efficiency sub-programmes (see details below under water quality, Option 2). At present there is interest in particular from the stakeholders involved in the shellfish industry in Galway Bay in an EU Life funded project.

Aims & Objectives:

- Determine the overall carbon footprint of the shellfish industry in Inner Galway Bay
- Reduced this carbon footprint and boost the net ecosystem carbon balance through more sustainable aquaculture techniques
- Establish the possibility to offset the remaining carbon footprint through native oyster reef restoration and implement such restoration
- Link aquaculture practices to quantifiable carbon storage through oyster reef restoration and developed a set of easy-to-measure indicators
- Incorporation of the projects results into national environmental and agricultural policy and legislation

Funding stream: Climate change mitigation

The climate action sub-programme supports projects in the areas of renewable energies, energy efficiency, farming, land use, and peatland management. It provides action grants for best practice, pilot and demonstration projects that contribute to the reduction of greenhouse gas emissions, the implementation and development of EU policy and law, best practices and solutions. The European Commission is particularly looking for technologies and solutions that are ready to be implemented in close-to-market conditions, at industrial or commercial scale, during the project duration. The sub-programme also promotes knowledge sharing and integrated approaches, such as for climate change mitigation strategies and action plans at local, regional or national level. Projects receive a co-funding of up to 55%.

Similar projects funded under EU Life are:

REMEDIA Life - Italy

Remediation of Marine Environment and Development of Innovative Aquaculture exploitation of Edible/not Edible biomass. Development of an integrated multi-trophic aquaculture (IMTA) system at the European level for the mitigation of negative environmental impacts of mariculture plants in a confined marine environment, with the use of a new set of bioremediator organisms whose action is more effective than the use of molluscs only.

oLIVE-CLIMA – Greece (Climate)

This EU Life award-winning project worked closely with farmers in Greece to boost the net ecosystem carbon balance through sustainable farming techniques that are adapted to climate change. Aspects of the country's rural development programme have been revised to take the project's lessons into account.

BLUE Natura (Climate Action) - Andalucia

The project aims to attain the protection of nature through the environmental services generated. It therefore focuses on ascertaining the role of blue carbon sinks, since nothing is known about seagrass meadows or marshes. To this end, various actions are going to be performed for the quantification of carbon stocks and analysis of their fixation and accumulation potential, as well as environmental services they generate in relation to

mitigation of climate change. The results of LIFE Blue Natura demonstrate that the conservation and restoration of EU Blue Carbon ecosystems could be economically sustainable, given the large stocks they accumulate.

Craft Life - Latvia

- Increase farmer and political decision-maker awareness about available GHG emission reducing agricultural practices by developing a guidebook that lists all the relevant climate responsible agricultural practices applicable in the Baltic Sea region;
- Implement, test and demonstrate 3 different GHG emission reducing agricultural management practices at farm level;
- Adapt remote sensing based monitoring instruments for improved evaluation of national policy efficiency targeting agricultural GHG emission reduction.

Option 2: Galway Bay South East catchment-wide water quality project aimed at improving overall water quality of all WFD waterbody types within the catchment

Funding stream: Environment and resource efficiency

LIFE co-finances projects in the environmental sector in particular in the areas of air, chemicals, green and circular economy, industrial accidents, marine and coastal management, noise, soil, waste, water, and the urban environment. The programme provides action grants for pilot and demonstration projects to develop, test and demonstrate policy or management approaches. It also covers the development and demonstration of innovative technologies, implementation, monitoring and evaluation of EU environmental policy and law, as well as best practices and solutions. The European Commission is particularly looking for technologies and solutions that are ready to be implemented in close-to-market conditions, at industrial or commercial scale, during the project duration. Projects receive a co-funding of up to 55%.

Project Detail:

This project would engage with the wider catchment to improve water quality through changes in agricultural management, including changes to current farming approaches, including and building on existing actions such as, for example, those specified under the GLAS agri-environment scheme. By engaging with the farming sector and by encouraging farmers to reduce their fertiliser and chemical use and hence potential runoff into water this project could improve water quality in the catchment and Inner Galway Bay. Based on the examples of successful projects in the Burren and on the Aran Islands, the project would ensure the sustainable agricultural management and improvements in water quality catchment-wide.

Feasibility:

Based on the responses from stakeholders in the wider catchment, a project aimed at engaging the whole Galway Bay South East Catchment and in particular all relevant members of the agriculture sector within the catchment would be difficult. For many relevant landowners and landusers in the upper catchment there is a definitive lack of connection to the coast and the sea. Overall, concerns for farmers in the upper catchment, concerns are at a more local level regarding the flooding of their own lands and how this can be managed, with support for local drainage schemes and little understanding of the impacts of the actions in the upper catchment on the lower reaches of the catchment and the bay itself. Stakeholders from the agriculture sector expressed frustration with existing measures and programmes such as GLAS and felt there was little benefit for them, and already finding it hard to farm without further action being required.

Alternative Project

Small scale water quality demonstration project based in one the sub-catchments, such as the Kilcolgan catchment/Dunkellin estuary which is part river and part groundwater fed, and/or the Ballyvaughan estuary, which is wholly groundwater-fed. This project would develop a 'Flow beneath your Feet' concept to generate understanding in the community about groundwater flow and vulnerability.

Coastal waters are directly impacted by any fresh water sources which discharge to the sea and both the quantity and quality of the fresh water can impact on estuarine and nearshore habitats such as fens, saltmarshes, mudflats and maerl beds. The quality of the fresh water inputs is influenced by human activities such as changes in demand for drinking water, contamination by sewage inputs, nutrient and effluent inputs from farmland, increases in paved area resulting from population increase and infrastructure changes (which alter runoff),

and land use changes. Coastal waters with submarine groundwater discharge are of particular interest as this fresh water source is very poorly quantified, and, because it is underground, is hidden from public view, leading to a lack of awareness about its importance and vulnerability.

In karst systems, point and diffuse source contaminants can be rapidly transported throughout the aquifer (days/weeks scale), depending on abstraction rates and the nature of the contaminant, affecting both drinking water quality and the water quality of the coastal water it flows into (Wheater et al., 2007). Such contaminants have the potential to detrimentally impact coastal and estuarine habitats as well as EU shellfish waters and bathing water, with knock-on effects on tourism.

In the south-east Galway bay area, south of the Dunkellin estuary, the fresh water discharge to the sea is all via submarine groundwater through a karst limestone aquifer (Figure 3), and there are significant groundwater inputs to the Kilcolgan/Dunkellin and Clarin estuaries (GSI and Drew, 1996). Using dye tracers, flow rates have been measured at 30 to 460m per hour, with inputs at any given point taking multiple paths to the sea, and with different underground pathways operating depending on the amount of groundwater in the system.

Aims & Objectives:

- Create much greater awareness of groundwater pathways and vulnerability through interactive visualisations, tourist signage and leaflets including for example QR code links to online resources, and education packages for schools linked to the curriculum
- Provide a support scheme to encourage the upgrading of domestic septic tanks to improve ground water quality
- Encourage the clearing of collapsed karst features which have over time become filled with rubbish, to reduce flooding
- Develop a pilot on a farm to show the groundwater pathways beneath it and use as a demonstration project to other farmers to promote and enhance their duty of care towards groundwater beneath their fields

Funding stream: Environment and resource efficiency

LIFE co-finances projects in the environmental sector in particular in the areas of air, chemicals, green and circular economy, industrial accidents, marine and coastal management, noise, soil, waste, water, and the urban environment. The programme provides action grants for pilot and demonstration projects to develop, test and demonstrate policy or management approaches. It also covers the development and demonstration of innovative technologies, implementation, monitoring and evaluation of EU environmental policy and law, as well as best practices and solutions. The European Commission is particularly looking for technologies and solutions that are ready to be implemented in close-to-market conditions, at industrial or commercial scale, during the project duration. Projects receive a co-funding of up to 55%.

Alternative Funding Stream: Integrated Funding

The alternative project can be an integrated project. Integrated projects combine LIFE funding with other sources of support to maximise their impact over a large area (regional, multi-regional, national or trans-national).

Under the environment sub-programme, these large-scale projects implement environmental plans or strategies required by specific EU laws. They primarily concern areas of nature (including Natura 2000 network management), water, waste, and air.

Under the sub-programme for climate action, these large-scale projects implement climate action plans, strategies or roadmaps required by specific EU laws, primarily in the areas of climate change mitigation and adaptation.

Projects receive a co-funding of up to 60%.

To implement this type of project and to achieve the expected results, European partners are required. The following karst regions in Europe with relevant shellfish industries could be suitable as partners:

- Spain: Balearic and Canary Islands, Cantabria, Extremadura, Galicia, Andalusia
- Greece: Crete Island, Northern Region
- Italy: Regio Calabria
- Turkey: Black Sea Northern Region, Izmir Region
- Croatia: Rijeka area
- Albania: Vlore area
- Georgia: Sochumi area

Similar projects funded under EU Life are:

EU Urban River LIFE Project - Dún Laoghaire Rathdown, Ireland

This project will be the Shanganagh River Catchment which contains three tributaries. The environmental pressures on streams in this catchment are the result of the suburban environment through which they flow: 1. Sewer OverFlows, and 2. Domestic Misconnections, which is the primary pressure. The discovery and removal of domestic misconnections is an extremely labour intensive and time consuming process with approximately 1 in 12 homes misconnected. Using the latest methods in GIS technology, the EU Urban River LIFE Project will explore methods to find misconnections in a much more efficient fashion, thereby speeding the removal of domestic from our streams.

REWAT - Italy

The General Objective (GO) of the REWAT project is to develop a participated strategy for integrated water resources management at sub-catchment level, as a model of governance for sustainable development of the lower Val di Cornia. This demonstration is exportable in other similar contexts at Mediterranean and European scale. Within this project, this strategy - adaptive towards Climate Change - refers to the water budget (re)balancing of the complex system of the lower river Cornia, through a rationalization of (civil and agricultural) water consumption and an increase in intentional groundwater infiltration rates (through river morphological restoration and managed aquifer recharge).

Option 3: Sustainable land use management for the conservation and restoration of the native oyster (*Ostrea edulis*).

Funding stream: Nature and biodiversity

The environment sub-programme funds nature conservation projects in particular in the areas of biodiversity, habitats and species. It provides action grants for best practice, pilot and demonstration projects that contribute to the implementation of the EU's directives on birds and habitats, the EU's biodiversity strategy to 2020, and the development, implementation and management of the Natura 2000 network.

Projects receive a co-funding of up to 60%. The co-financing rate can be up to 75% if at least half of the total estimated project costs are used for actions to improve the conservation status of priority habitats or species listed in the EU's birds and habitats directives.

Project Detail:

Sustainable land use management for the conservation of the native oyster (*Ostrea edulis*) could be a demonstration project to restore the native oyster. This project would be aimed specifically at the conservation and restoration of the native oyster.

Oysters are an ecosystem engineer and keystone species (Jones et al. 1994, Gallardi 2014) and they provide a range of ecosystem services. They create habitat for species such as molluscs, polychaetes, crustaceans, and other invertebrates, all of which provide further shelter and feeding grounds, contributing both directly and indirectly to enhanced production of economically important fishery stocks (Wells 1961, Bahr and Lanier 1981, Rothschild et al. 1994, Coen et al. 1999, Breitburg et al. 2000, Harding and Mann 2001, Peterson et al. 2003, Tolley and Volety 2005). Within this food web oysters also promote increased transfer of energy among trophic levels and can help counteract increases in anthropogenic nitrogen loading (Coen et al. 1999, Baird et al. 2004, Newell et al. 2002, Piehler and Smyth 2011). Oyster, like other bivalves, have the capacity to clarify water and extract excess phytoplankton that can have harmful effects in eutrophic areas, and/or from enhanced seabed organic enrichment (Callier et al. 2008, D'Amours et al. 2008) (Figure 5). Oyster reefs can help reduce erosion of other habitats such as salt marshes by attenuating wave energy and stabilising sediments (Meyer et al. 1997). As detailed above, oysters take up carbon (Option 1 above).

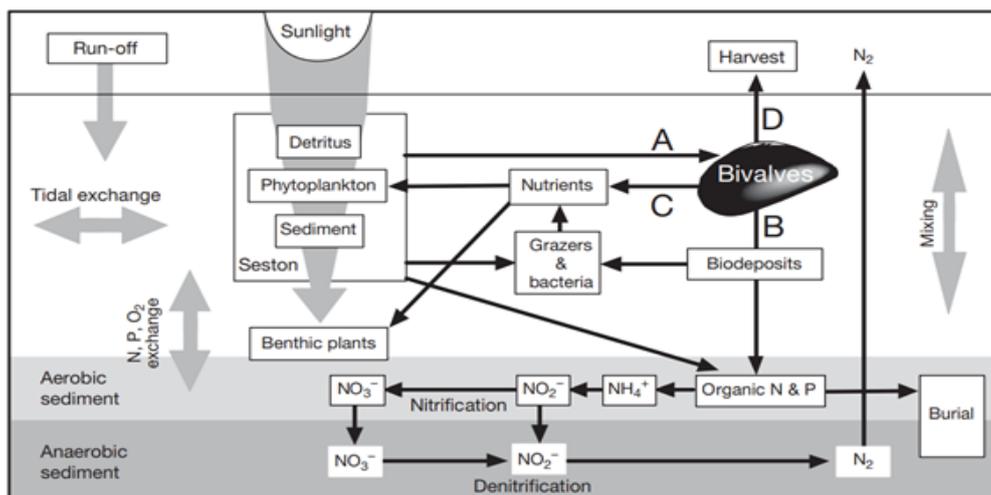


Figure 5: Conceptual diagram of bivalve interactions in coastal ecosystems related to: (A) the removal of suspended particulate matter (seston) during filter feeding; (B) the biodeposition of undigested organic matter in faeces and pseudofaeces; (C) the excretion of ammonia nitrogen; and (D) the removal of materials (nutrients) in the bivalve harvest (Cranford et al. 2006)

Irish coastal waters present the physical conditions for widespread distribution of the native oyster. While natural stocks are generally depleted, some traditional oyster harvesting still takes place in several locations along the western and northern coasts, including Inner Galway Bay. These are, unlike in other countries, wild populations rather than commercial cultures which are harvested in autumn and winter with the help of dredges. Overall, national harvest is up to 300 tons per annum, depending on enforced quotas (Tully and Clarke, 2012). Conserving and restoring native oyster reefs in Inner Galway Bay could help promote the above mentioned ecosystem services and, considering the oysters role as a keystone species, provide habitats for a whole range of additional species, both of commercial and non-commercial value.

Feasibility:

This funding stream is focused on the implementation of the EU's directives on birds and habitats, the EU's biodiversity strategy to 2020, and the development, implementation and management of the Natura 2000 network. This means a project focussed native oyster conservation/restoration does not fall under this remit. While stocks are declining, this is still a commercially harvested species, and not yet endangered or protected by relevant EU legislation. A project focussed on the native oyster would therefore not be focussed on a species or habitat protected under EU conservation legislation (Habitats & Birds Directives), such as, for example the Freshwater Pearl Mussel, Hen Harrier or Peatlands, and therefore not be suitable under this funding stream.

Furthermore, based on the responses from stakeholders in the wider catchment, a project aimed at engaging the whole Galway Bay South East Catchment and in particular all relevant members of the agriculture sector within the catchment would be difficult. For many relevant landowners and landusers in the upper catchment there is a definitive lack of connection to the coast and the waters within which native oysters are found. The main concerns for farmers in the upper catchment are flooding of their own land, a sense that there are already too many restrictions that are making farming difficult and there is a lack of understanding on the side of many farmers for the concerns of shellfish farmers in Galway Bay: there is a lack of understanding of the required conditions for shellfish farming, lack of comprehension of their impacts on the declining environmental conditions in the bay, and a lack of empathy for an industry producing 'luxury foods', even if it is threatened. Furthermore, as the species is not as such protected under current EU legislation, many stakeholders did not comprehend the need for a project focussed on the protection of the oyster, in particular seeing that the species is still being harvested commercially, a frequent question was if it would not be merely sufficient to stop harvesting it to ensure its conservation and restoration. At present there appears to be little support for a Galway Bay South East Catchment-wide project in general and in particular for the conservation/restoration of the native oyster.

Alternative Project:

A smaller biodiversity project could be feasible. A project with key actions aimed at improving and protecting species and habitats of European importance in and around South-East Galway Bay that are impacted by water quality and disturbances such as: *Salicornia* and other annuals colonising mud and sand, Mudflats and sandflats not covered by seawater at low tide, Large shallow inlets and bays, Reefs, Otters (*Lutra lutra*) could be considered, however there would be no focus on the native oyster (*Ostrea edulis*). While native oysters live on reefs, they are not one of the species listed for this habitat.

Aims & Objectives:

- Maintain or increase current area or population size of relevant habitats and species
- Work with farmers to solve the challenges faced by farmers and reduce negative impacts on water quality
- Provide a support scheme to encourage the upgrading of domestic septic tanks to improve water quality
- Examine alternatives to harvesting by dredging for native oyster and ensuring protection of reef habitats
- Improve mooring design to reduce disturbance and enhance area for species settlement
- Create much greater awareness of protected habitats and species in and around South-East Galway Bay
- Provide guidance for tourism, farming and domestic sectors that support the conservation of relevant habitats and species

Similar projects funded under EU Life are:

KerryLife Project - Ireland

The KerryLIFE project 'Sustainable land use management for the conservation of the freshwater pearl mussel' is a demonstration project to restore the endangered freshwater pearl mussel.

Duhallow LIFE SAMOK Project - Ireland

This Project initiated a conservation and restoration strategy for many endangered fish, mammals and birds found in the Munster Blackwater River Special Area of Conservation, which included farmland and in-stream works along the Allow River. Key project on-the-ground actions are aimed at improving and protecting animal species of European importance; European otter, Kingfisher, Atlantic salmon and Freshwater Pearl Mussel found in the Upper River Blackwater. The River Blackwater is a special area of conservation.

MulkearLIFE - Ireland

MulkearLIFE is a project working to restore degraded habitats through the Mulkear Catchment, which forms part of the Lower Shannon Special Area of Conservation.

LIFE Danube floodplains project - Slovakia

The LIFE Danube floodplains project aims to restore the key natural habitats of Danube floodplains and to introduce sound sustainable management. Habitat restoration will be achieved by the improvement of water regime in the vast river branch system and by direct interventions to secure favourable conservation status of targeted habitats. Specific objectives are to:

- Optimise water level and distribution of water within the Danube river branch system and in Danube floodplains;
- Restore the water regime of selected disturbed localities;
- Restore targeted habitat types and improve their conservation status;
- Increase biodiversity of floodplain forest habitats, production potential and ecosystem services of forest management;
- Improve the conservation status of the last remaining fragments of non-forest habitats within the project site; and
- Raise awareness of the importance of floodplain restoration, disseminate knowledge for replication and transfer results and best practices.

3. Non-EU Life funding opportunities

The following are additional possibilities for project funding under some European programs or through national programs, which are based on funds from the European Union.

1. Rural development

Grant support for rural development is available under the LEADER Programme 2014-2020 to support projects under the following themes:

- Economic Development, Enterprise Development and Job Creation
- Social Inclusion
- **Rural Environment.**

LEADER supports private enterprises and community groups who improve quality of life and economic activity in rural areas. Funding is delivered to 28 sub-regional areas through Local Action Groups (LAGs). These groups are partnerships of public and private entities from a defined geographical area. Local action groups are responsible for local projects in accordance with the local development strategies they develop themselves.

This aid is provided to projects under the following themes:

- economic development, enterprise development and job creation
- social inclusion
- rural environment

Decisions on LEADER funding are made at a local level by a network of Local Action Group (LAGs). A community-led Local Development Strategy provides the framework within which decisions are made. For further information on LEADER funding in your local area, including how to apply for grants, you can contact your Local Action Group.

Project Opportunity:

Local Objective Six: Protection and Sustainable Use of Water Resources, 6.1 Community – based management and conservation of water resources: Strategic Supports include: • Support initiatives which create awareness of water management issues and encourage conservation i.e. reducing waste, grey water

Local Objective Seven: Protection and Improvement of Local Biodiversity, 7.1 Delivery of Biodiversity Awareness Programmes: Strategic Supports include: • Support training, seminars and awareness programmes on the promotion and protection of local biodiversity • Creating awareness and eradication of invasive species of plant, or encourage communities to develop 'more attractive areas' • Fund small scale capital projects i.e. nature corridors and habitat creation and conservation

2. Interregional

These funds allow for collaboration between neighbouring regions and focus on community and business innovation; entrepreneurship and increasing competitiveness of various regions; renewable energy, shared **environmental challenges**, and climate change; and **promoting and developing natural and cultural** heritage.

- [Ireland Wales Fund](#) - connects organisations, businesses and communities on the West coast of Wales with the Southeast coast of Ireland.
- [Interreg Northern Periphery Programme](#) - Addresses shared challenges and opportunities in the Euro-Arctic zone including Finland, Ireland, Sweden and the United Kingdom (Scotland and Northern Ireland) in cooperation with the Faroe Islands, Iceland, Greenland and Norway.
- [Interreg VA](#) - supports European territorial cooperation between eligible regions in Ireland, Northern Ireland, and Scotland around a range of issues from access to transport, health and social care services, environmental issues and enterprise development.

- [Peace IV Programme](#) - supports peace and reconciliation in Northern Ireland and the Border Counties of Ireland, including Cavan, Donegal, Leitrim, Louth, Monaghan and Sligo.

Example of existing projects:

IBIS NATIVE OYSTER PROJECT - Loughs Agency, Queen's University Belfast, Glasgow University
This project addresses the severe decline of the European native oyster populations due to overexploitation & disease. It aims to ensure the conservation/protection of the species.

The project is based in Lough Foyle and hopes to:

- Investigate key areas of oyster biology/ ecology
- Develop easily applied audit points and strategies for sustainable management

3. Research and Innovation

Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020). It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market.

There are significant opportunities for community, voluntary and charitable organisations and social enterprises to partner with researchers and industry to tackle societal challenges. Our sector has unique insight and skills in facilitating ethical research and ensuring the appropriateness of technology and innovation designed to benefit the target groups with whom we work.

The societal challenges dealt with by Horizon 2020 include:

- Health, Demographic Change and Wellbeing
- **Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy**
- Secure, Clean and Efficient Energy
- Smart, Green and Integrated Transport
- **Climate Action, Environment, Resource Efficiency and Raw Materials**
- Europe in a changing world - Inclusive, innovative and reflective societies
- Secure societies – Protecting freedom and security of Europe and its citizens.

A popular Horizon 2020 fund for civil society is the [Marie Skłodowska-Curie actions](#) and, within that, the [CAROLINE programme](#), which enables organisations to partner with universities to host fully-funded researchers to conduct research in their area.

Example of existing projects:

Sustainable and Environmentally friendly Aquaculture For the Atlantic Region of Europe (SEAFARE)

SEAFARE will develop solutions to specific constraints on industry development for Europe's fish and shellfish farmers, through species diversification and development of low-intensity aquaculture systems that are compatible with sensitive coastal habitats. SEAFARE brings together applied R&D centres, aquaculture industry organisations and environmental agencies across the Atlantic maritime region, to promote sustainable expansion of European aquaculture.

4. Creativity and the Arts

Creative Europe is the European Commission's framework programme for support to the culture and audio-visual sectors.

It funds:

- **Culture sector** initiatives, such as those promoting cross-border cooperation, platforms, networking, and literary translation.
- **Audio-visual** sector initiatives, such as those promoting the development, distribution, or access to audio-visual works.

- **Cross sectoral** opportunities
- **Youth** and the arts.

Creative Europe's stated aims are to:

- Help the cultural and creative sectors seize the opportunities of the digital age and globalisation;
- Enable the sectors to reach their economic potential, contributing to sustainable growth, jobs, and social cohesion;
- Give Europe's culture and media sectors access to new international opportunities, markets, and audiences.

Example of existing projects:

Follow the Vikings - is a transnational project to promote heritage tourism in Europe. The Follow the Vikings project has four main objectives; Audience Development, Building competence in business models, Strengthening the international network and developing an international touring event. The work programme is substantial with six work packages in place; Project management of the project; Exchange of knowledge on design, presentation and exhibition; Developing a Viking brand, website, guide and a marketing strategy; Collection and pooling of Viking resource material and the production of a Viking graphic novel; Develop an international touring event; Develop a marketing plan, an audience development plan, a best practice guide and a retail product guide.

5. European Maritime and Fisheries Fund

Various incentives have been developed to increase EU aquaculture production. The EU's Blue Growth agenda for economic growth and employment has singled out the sector as one of its priorities. Several measures to stimulate aquaculture are included in the Common Fisheries Policy and the new European Maritime and Fisheries Fund. The registration for the European Maritime and Fisheries Fund Information Day just opened. A total budget of € 22.5 million is available under the 2019 "Blue Economy Window" call. Under the 2019 call, organisations can get between €700,000 and €2,500,000 for their projects. Any for-profit SME based in the EU (single participant or a member of a consortium) can apply.

The call includes an action grant for which the objective is to develop and bring to market new products, services and business models that could develop pre-commercial innovations into ultimately revenue-generating activity. This will involve in particular the sustainable use of marine resources for innovative and/or circular economic activities, improved livelihoods and jobs, whilst contributing to EU goals. EU goals include in particular a sustainable blue economy, especially in Europe's sea basins, energy and food security, circular economy, reduced carbon and environmental footprint and competitiveness on a global scale. The grants shall aim to develop business concepts further into a market-ready product, service or process aligned with the applicant's blue economy growth strategy.

Information Day: 25th of November, Brussels, Belgium

<https://ec.europa.eu/easme/en/2019-european-maritime-and-fisheries-fund-info-day>

Project Opportunity:

This will not change the current environmental conditions in which shellfish farming currently takes place, this call is focused on blue growth and business development. The aim of this action call is to bring to market new products, services and business models in the blue economy value chains and sustainable blue innovation in Europe's sea basins. Any project to consider here would have to have an economic aspect to them, to develop business concepts further. The question here is if there is anything relevant to the shellfish industry that would be linked to the development of business concepts further into a market-ready product, service or process aligned with a blue economy growth strategy?

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4. Stakeholder Feedback

According to Freeman's classic definition a stakeholder is: 'any group or individual who can affect or is affected by the achievement of the organization's objectives.' For the purposes of this feasibility study, stakeholders included members of the following groups (Figure 6):

Aquaculture Sector: members of the local shellfish and oyster fishing community (n=12)

Agriculture Sector: those involved in agriculture in the catchment, including land owners and users and members of representative organisations (n= 28)

Other Industry Sectors: those involved in tourism, recreation and hospitality (n= 5)

Researchers: subject experts who are engaged in research related to relevant activities in the catchment (n= 6)

Public Sector: those working in a local authority, for conservation body, NGO or implementing agri-environment schemes (n= 7)

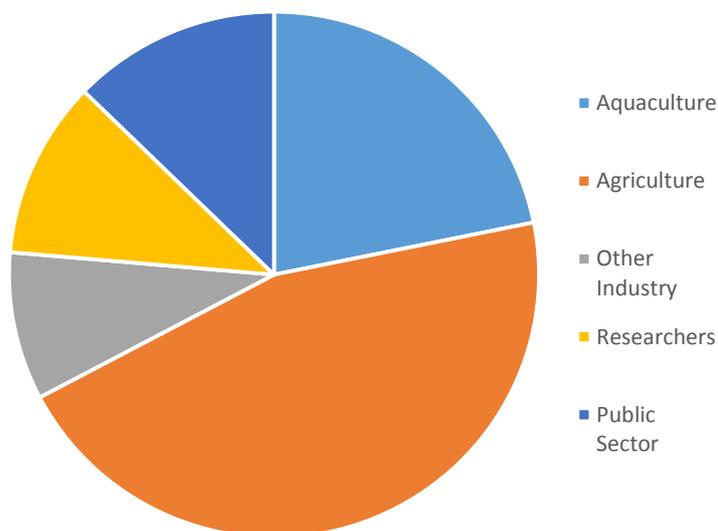


Figure 6: Stakeholders according to category included in the feasibility study

Outcomes:

All conversations with stakeholders were anonymous and confidential, so feedback is reported in general terms.

In particular, members of the shellfish sector showed great interest in a project connecting their areas of work with the wider catchment. While there was a general willingness to provide opinions for the feasibility study, there was less interest and support from the farming sector for such a project, with a disconnect apparent in particular between those in the upper parts of the catchment and those in coastal regions. Stakeholders were not asked specifically about their knowledge of and views on Cuan Beo, however, some of the stakeholders were familiar with Cuan Beo and their work and stakeholders noted their work favourably.

Stakeholders were asked what the main issues were that a catchment-wide project should address. The following issues were raised:

- **Flooding:** a major issue in particular in the upper catchment was flooding/drainage and the need for flood alleviation measures. The need to address what was perceived as extensive flooding was seen as instrumental by stakeholders in particular in the upper parts of the catchment. Concerns about the suitability of current/proposed drainage and flood alleviation works was raised by stakeholders in the lower catchment. Concerns about blocking or unblocking of swallow holes was also raised in relation to flooding.
- **Water quality:** pollution from agriculture and septic tanks were noted as issues that should be addressed in the catchment. In relation to agriculture, stakeholders (predominantly from non-agriculture sectors) observed that fertiliser/pesticide spreading needed to be addressed but poaching by

cattle should also be considered. Better implementation of measures such as those proposed by GLAS were all seen as possible solutions. Further suggestions included changes to how slurry is being spread and broadening of existing schemes. Suggestions were also made that more grant aid should be made available, together with improved access to equipment and education on how better methods could be implemented.

While agriculture was identified as a source of water pollution that needed to be considered, many stakeholders also noted that septic tanks are a major source of water pollution, with some concerns raised regarding the occurrence of the norovirus. The need to update current septic tanks/wastewater treatment works was recognised by many (across all sectors), supplemented by requests for improved monitoring of septic tanks.

Recommendations were made that the sources of pollution and pollution pathways should be researched further before water pollution overall could be tackled.

- Climate change: the need to consider climate change was noted by stakeholders. Here, the need to reduce emissions and address the levels of greenhouse gasses produced were noted. Suggestions to address this included: bioreactors, tree planting, sustainable farming and aquaculture, carbon credits and renewable energy. Also, increased frequency of storms and high waters events and a need to ensure preparedness for such events was mentioned by stakeholders.
- Tourism: a sector many stakeholders noted as economically important was tourism, with an increase in local initiatives and an increase in visitor numbers seen as important to future economic growth. While attention was drawn to existing initiatives, some stakeholders felt their areas had been left behind in relation to tourism. In the upper catchment tourism was seen as something that had not been developed at all for the area, while in the lower catchment this was seen as an area for further growth. Overall tourism was seen as an instrument that should be used more effectively to increase the local economy. Increased funding and advertising were proposed as pathways to increase tourism, with special interest events/tours proposed by others; suggestions included agri- and aqua-tourism, food tourism and festivals.
- Invasive species were noted as a concern, with better monitoring and treatment options being called for to prevent spread of existing and introduction of new invasive species in both aquatic and terrestrial habitats.
- Links to existing initiatives/schemes: with existing agri-environment schemes and initiatives such as Tidy Towns and Clean Coasts in the area, suggestions were made to link up with them on education initiatives and projects.
- Income comparison: a suggestion was made to carry out research into the comparative incomes of the agriculture and aquaculture sectors to provide an understanding of how dis/similar the sectors are before engaging both on a project.

Suggestions of who should be included in a relevant project included:

- Locals and the local community
- Local interest groups (swimming groups, Tidy Towns, kayakers)
- Local authorities/Government
- Inland Fisheries Ireland
- National Parks and Wildlife Services
- Marine Institute
- Irish Water
- Office of Public Works
- Burren Beo