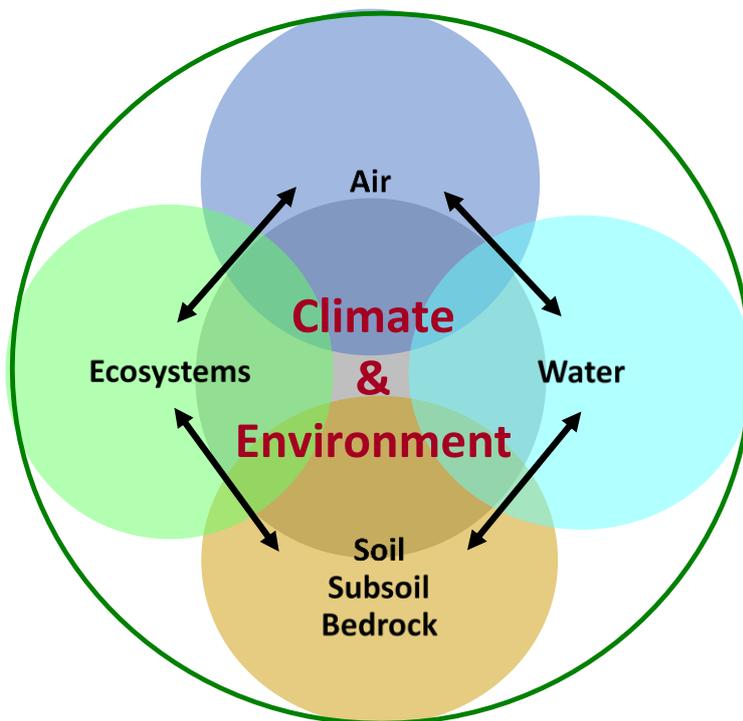


Protecting and Enhancing Our Environment

A Framework for Integrated Land and Landscape Management



August 2020

Contents

Summary	1
Introduction & rationale	2
Integrated Catchment Management	5
A Reconceptualised Approach – a Framework for Integrated Land and Landscape Management	5
From ICM to FILLM.....	6
Using the Framework for Integrated Land and Landscape Management	7
Delivering FILLM into the Future	8
Appendix 1: National and international policies and recommendations for an integrated approach to environmental management	11
Appendix 2: The Integrated Catchment Management Approach	13

A Framework for Integrated Land and Landscape Management

Summary

1. Ireland's natural environment is an inheritance for present and future generations. Protecting and managing this inheritance is particularly demanding in the context of the climate crisis, stressed water resources, declining biodiversity and the Covid-19 pandemic. Getting the balance between our food and economic needs now and in the future, and achieving environmental sustainability, if not regeneration, is an existential challenge. While there are different ways of meeting this challenge, undoubtedly one way is developing and utilising a systems approach that takes account of all relevant aspects in an integrated manner.
2. There is commonly a tendency to treat each component of the environment as siloes, dealt with by particular specialists and organisations. While this is understandable and will have continuing benefits, it is not adequate and will not ensure that our inheritance is maintained and enhanced.
3. We live in an interconnected world. More specifically, all the components of our natural environment – air, water, ecosystems, soils, rocks, land, landscapes – are interrelated and interlinked. Therefore, management of these components, in the context of society's needs for nourishing food, good health and economic wellbeing, must take account of the linkages and must be undertaken in a cohesive, holistic and integrated manner. Otherwise, our natural environment will continue to decline, and our protection efforts will not be either efficient or effective.
4. An Fóram Uisce is proposing the adoption of a systems approach in the form of a Framework for Integrated Land and Landscape Management that enables inclusion of all the relevant aspects in a cohesive and unified manner.
5. The Framework for Integrated Land and Landscape Management (FILLM) builds on and is a reframing of the Integrated Catchment Management (ICM) approach used in water resources management. However, it broadens it to include the other components of our natural environment, while retaining catchments as the appropriate landscape units. In the process, FILLM becomes the overarching framework for environmental management as a means of connecting, for instance, the Water Framework Directive, Urban Waste Water Treatment Directive, Habitats Directive, Floods Directive, Drinking Water Directive, climate change adaption and mitigation, soil conservation, spatial planning, and sustainable food and timber production. In addition, it is a means of achieving the UN Sustainability Goals for 2030.
6. Ultimately, it is the implementation of measures and actions that are key to attaining the various environmental outcomes for water, air and ecosystems. Acceptance and use of the FILLM approach by policy makers, public bodies with an environmental remit and local communities encourages consideration of co-benefits, identification of synergies and can facilitate trade-offs where synergies are not feasible. Therefore, the approach helps ensure optimum results for the efforts and resources used.
7. One of the purposes of this document is to present a vision and a conceptual framework which will guide the thinking and positioning of An Fóram on the range of matters and issues on which An Fóram considers appropriate to advise and comment on.

Introduction & rationale

Our natural capital in Ireland, which is the foundation of our social, economic and health wellbeing, is being challenged on several fronts by human activities. Our water quality is not improving as required by the Water Framework Directive and is slightly dis-improving, our biodiversity is declining, and the increasing greenhouse gas (GHG) emissions and associated climate crisis is the biggest environmental threat facing Irish society. At the same time our population is increasing, maintaining safe, secure and stable water supplies and managing our wastes is challenging, and there is a need for a sustainable and resilient food production system. All these issues are **interconnected**. For instance, the changing climate regime has consequences for our water resources (quantity and quality), for our ecosystems, for food production and for our health and wellbeing. In turn, declining ecosystems and soil quality impinge on carbon sequestration and our resilience to cope with climate generated impacts. But, while there are challenges, we have many encouraging features, for instance, unspoilt areas, high quality food production and many catchments with good quality water resources, all of which are beneficial to people as well as to the economy. Measures and actions are needed to protect our environment where it is satisfactory and mitigate the impacts where it is under threat or is unsatisfactory. It is now clear that many of the necessary measures and actions undertaken or planned for one component of the environment have co-benefits for other components because of the **connectedness** of nature. Therefore, there is the opportunity to adopt a systems approach to environmental management that takes account of all the environmental components and requirements in an **integrated** manner as a means of delivering effective and efficient outcomes for the environment and Irish society.

While there has been a tendency in the past to consider and manage all the environmental components – water quality and quantity, air and climate, habitats and biodiversity, landscape, soils and geological materials – as separate entities, usually with specific public bodies having responsibilities for them, this is now being replaced by a view that a more holistic and integrated approach that links all the components (Figure 1), as well as the interaction with human activities, is needed.

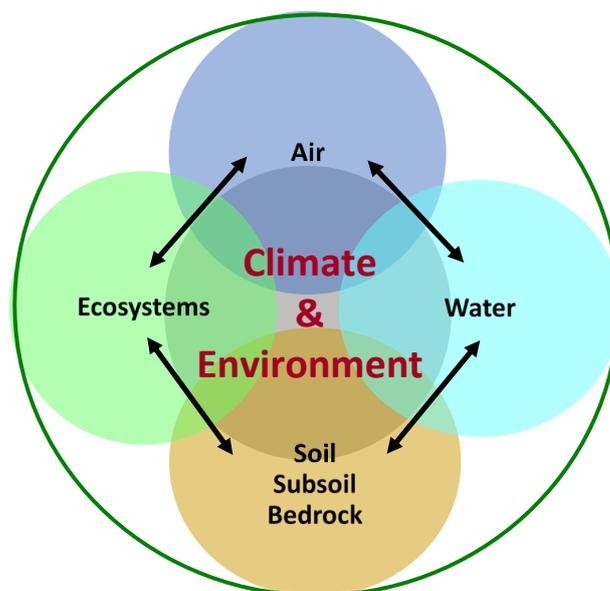


Figure 1: Illustration of the 'whole of environment' components and linkages.

This change is occurring for the following reasons:

- The increased understanding that ‘everything is connected’ in the landscape.
- Our understanding and appreciation of landscape¹ has increased, as indicated by the National Landscape Strategy for Ireland 2015-2025². Landscape is our living natural and cultural heritage, be it ordinary or outstanding, urban or rural, on land or in water. It is the source of well-being for society and economic activity. It provides a connection to past and future generations and as such we have an obligation to protect it.
- The adoption of systems thinking³ and the systems approach in environmental management. For instance, in addition to the human-social-economic system in an area, there are three systems provided by nature – ecosystems, geosystems and atmospheric systems, as illustrated in Figure 2. All can be considered as interconnected, interacting and interlocking to varying degrees.
- Many of the key issues we now face are complex problems involving multiple pressures acting in combination, and therefore require action with multiple sectors, which local partnerships are well placed to facilitate.
- Our growing population and expanding urban footprint, which results in higher stormwater flows and greater quantities of municipal waste water.
- The food system – production, consumption, security and trade – is being challenged by the need for environmental sustainability in the areas of climate change mitigation and adaptation, biodiversity and habitat protection, soil conservation and water quality.
- The acknowledgement that climate change is the biggest threat we face, with challenges for our environment and consequently our lives and livelihoods. The water environment (rivers, lakes, groundwater, wetlands, estuaries and coast), its ecology and the essential services it provides society, will be radically affected by these emerging challenges. Likewise, our habitats, biodiversity and our soils are threatened. How we respond to these challenges will determine how successful we are in protecting and enhancing the water, ecosystem and soil environment.

The change is illustrated by deliberations and recommendations at both international and national level; for instance, the UN Sustainability Goals, the EU vision of ‘living well within the limits of our planet’, the EU Green Deal, and the seven key environmental actions recommended by the EPA. More details are given in Appendix 1.

As a consequence, there is a requirement for the following:

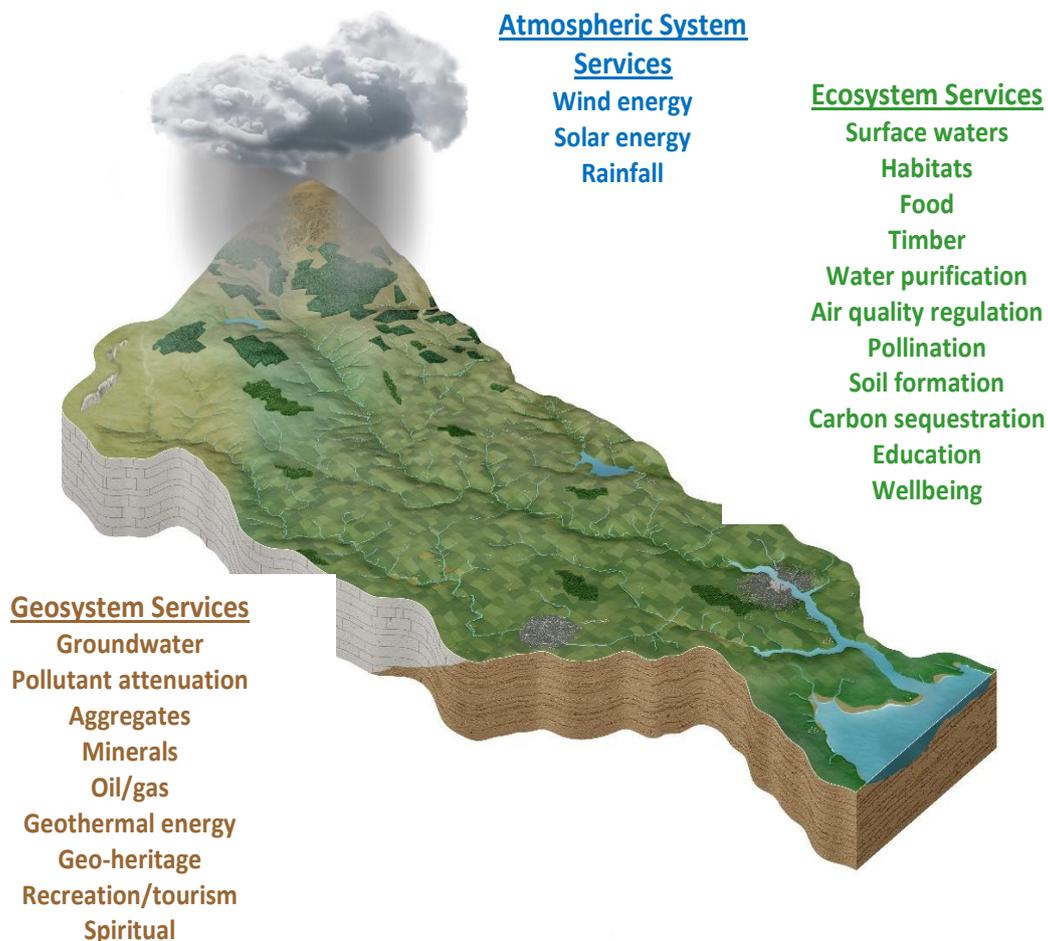
- Policy coherence and policy integration. This may require transformative change at government level and among public bodies.
- Taking a whole systems approach which requires a multi-disciplinary, multi-objective and multi-stakeholder framework supporting a balanced evaluation of all relevant issues.
- Making the linkages between the environmental components and human activities, and taking account of the benefits (co-benefits), disbenefits and trade-offs.

¹ According to Article 1.a. of the European Landscape Convention, “landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors”.

² <https://www.chg.gov.ie/app/uploads/2015/07/N-Landscape-Strategy-english-Web.pdf>

³ An integrated, holistic approach to analysis that focuses on the way that a system’s constituent parts interrelate and how systems work over time and within the context of larger systems.

- A spatial planning system that takes account of all environmental components in a holistic, cohesive way. Reduced compartmentalisation of planning and actions within the various environmental components is needed, as cross-component planning can deliver benefits in terms of cost-efficiency and environmental effectiveness.
- Connecting the requirements and implementation of the various Directives, such as the WFD, Habitats, Birds, Floods, Drinking Water, Marine Strategy Framework, Nitrates and Urban Waste Water Treatment, and of policies such as the Common Agricultural Policy (CAP), European Landscape Convention, climate change and forestry.
- A means of delivering on and balancing multiple objectives, while managing the synergies and trade-offs in a transparent way.
- An evaluation of land suitability for various activities, including food production and provision of environmental services.
- Taking a collaborative place-based approach working across all relevant sectors and in partnership at local and national level.



Services Provided by Nature in Catchments

Figure 2: Schematic diagram of a catchment highlighting the three natural capital systems and the potential benefits provided by nature to people living in catchments

Integrated Catchment Management

The EU Water Framework Directive (WFD)⁴ is the corner-stone of European water policy. It has provided the structure for integrated water resource management across the European Union over the last 20 years. The central concept to the WFD is **integration** as this is seen as key to the management and protection of water within river basin districts. This includes integration of, for instance: i) all water resources combining fresh surface water and groundwater, wetlands and coastal water resources at the catchment scale; ii) environmental objectives for water bodies; iii) water uses, functions and values; iv) disciplines and expertise; v) stakeholders and civil society; vi) measures to achieve the objectives; and vii) the different decision-making levels (local, regional and national) that influence water management. The Integrated Catchment Management (ICM) approach was developed as the means of enabling the required integration. This is acknowledged in the RBMP for Ireland 2018-2021⁵ as follows: *“A new approach to implementation known as ‘integrated catchment management’ is being used to support the development and implementation of the RBMP, using the catchment (an area that contributes water to a river and its tributaries, with all water ultimately running to a single outlet) as the means to bring together all public bodies, communities and businesses.”* ICM is the ‘starting point’ for a new broader approach to environmental management, which is provided by the Framework for Integrated Land & Landscape Management (FILLM) proposed and outlined in this document. ICM as currently applied is outlined in Appendix 2.

A Reconceptualised Approach – a Framework for Integrated Land and Landscape Management

An Fóram proposes further development of the ICM approach as a framework for integrated land and landscape management. This would address catchments as the landscape/spatial units but approached from a holistic systemic-perspective, simultaneously focusing on the atmospheric system, the ecosystem and the geosystem. In this way it would aim to trigger a virtuous dynamic within and between all three systems in a coherent drive towards environmental enhancement.

This new proposed approach must not only consider the biophysical elements but also the human dimension. The field of environmental sociology is a relatively recent development in sociology. Broadly, it refers to the reciprocal relationships between society and the environment. In this regard it tries to understand the social factors which underpin environmental damage and those which can act as positive forces in environmental enhancement efforts. Within the FILLM approach, the nature of this reciprocal relationship between society and the environment is pivotal. It can be argued that in the absence of a social dimension, a self-sustaining balance between the elements of air, water and soil is always immanent if not always evident. Natural imbalances can obviously occur without any human intervention as in the case for instance of volcanic eruptions, earthquakes or tidal waves. But the steady state is of a self-managing and self-sustaining systemic flow between these spheres. Human intervention can disrupt this inherent process of virtuous transfers

⁴ https://ec.europa.eu/environment/water/water-framework/index_en.html

⁵ <https://www.housing.gov.ie/water/water-quality/river-basin-management-plans/river-basin-management-plan-2018-2021>

between these spheres. This occurs when a contamination or distortion in one sphere is transferred between the spheres thereby accentuating imbalance rather than balance. Where this imbalance becomes acute – as in the case of climate change – the distortion process in all spheres becomes cumulative, self-generating, and ultimately global. It is axiomatic that the challenge of reversing such negative flows into and between the spheres now becomes one of social determination and global in scale. Issues of governance, regulation, and the distribution of costs and benefits within society, assume major significance. With the recognition that the spheres of land, water and air are a symbiotic whole comes major challenges but also the consciousness of co-benefits – that a positive intervention in one sphere can have positive consequences in each of the others.

From ICM to FILLM

The original Integrated Catchment Management (ICM) approach is reconfigured as a Framework for Integrated Land and Landscape Management (FILLM), as outlined in Figure 3. While it maintains the required sequential and iterative process, it has been broadened and made more generic to suit achievement of not just the WFD objectives, as in the original approach, but also the Drinking Water, Floods and Habitats Directives objectives. It indicates that stakeholder engagement and input are needed during five of the six stages. It also highlights that consideration of greenhouse gas emission reduction and carbon sequestration can be taken into account throughout the process.

Traditionally, the vision and definition of a catchment was based on it being an area formed by topography that contributes water to a river and its tributaries, with all water ultimately running to a single outlet. While this is accurate from a hydrological perspective, catchments can be defined and considered in a far broader and relevant way, as follows:

A catchment is a multi-functional, topographically-based, dynamic, multiple-scale socio-biophysical system; defined by over ground and underground hydrology; connecting land, water, ecosystems, geosystems, atmospheric systems and people; and used as the basis for environmental analysis, management and governance.

By utilising this concept and understanding of catchments, they become appropriate and effective landscape units for environmental management and land-use planning, as highlighted below:

- They connect water 'from the mountains to the sea' via over ground and underground pathways. In the process, all human activities in catchments are connected.
- They connect many habitats from mountainous to riverine to estuarine to coastal, particularly aquatic habitats.
- In terms of their landscape and history, catchments of both local and national rivers and streams are recognised generally, to a greater or lesser degree, by local communities as part of their 'sense of place'. Features such as streams, associated habitats, holy wells, etc. are used by local communities for their enjoyment and wellbeing. In addition, there is potential to base appreciation of nature among catchment communities on water features, habitats, fishing, etc.

- Catchments are being used internationally and in Ireland⁶ as the framework for natural capital (ecosystems, geosystems, atmospheric systems) accounting, and particularly for assessing ecosystem services (see Figure 2).
- Local government boundaries are not suitable for water and biodiversity management; catchments are.

Using the Framework for Integrated Land and Landscape Management

There are many benefits from using the Framework:

- It provides a basis for a shared vision of land utilisation and management that includes all stakeholders, all human activities and all environmental components.
- It acknowledges ICM as an essential approach for successful water resources management and WFD implementation, and reframes it as a critical driver for wider environmental protection and enhancement. For instance, FILLM is recommended as a structured approach for integrated ecosystem management.
- It makes environmental management more understandable and appealing to local communities because many householders and farmers 'see' the surrounding landscape as a mosaic of topographical, physical, ecological, cultural and infrastructural features and functions with no clear boundaries between them, particularly those that are the natural capital or components of an area.
- It provides the opportunity and encouragement for policy coherence and integration in land, landscape and nature management in a context where there are multiple environmental and socio-economic needs.
- It encourages different relevant disciplines and organisations to collaborate in the pursuit of mutually beneficial objectives.
- It takes account of situations where pressures that are seen to impact on one element of the environment in a catchment often impact on others, e.g. intensive farming can impact not only water quality, but also biodiversity, and can increase carbon and ammonia emissions unless actions are taken to mitigate impacts.
- It enables environmental management actions to be optimised in terms of cost-effectiveness and environmental benefits, takes account of trade-offs and helps avoid conflicts.
 - It encourages a multifunctional approach to land-use, encompassing all the particular ecosystem, geosystem and atmospheric system services in a catchment area.
 - It facilitates greater integration of resource use, including nutrient cycling, spatial distribution of 'natural' and productive land, and renewable energy generation and biofuels.
 - It encourages identification of those situations in which management practices that achieve benefits for one environmental issue could conflict with the delivery of other environmental priorities so that such conflicts can be resolved.
 - It enables agri-environmental and forestry environmental schemes to be considered as an integrated process.

⁶ <https://www.incaseproject.com/about-the-project>

- It discourages ‘one-off’ actions to deal with a singular environmental issue without consideration of the potential for ensuring optimum environmental benefits and cost-effectiveness.
- It encourages optimum location of protection and improvement measures, for example, planting of native woodlands as buffer zones alongside streams.
- It enables and encourages greater cooperation between different agencies, industries and civil society to more effectively plan and manage areas of mutual interest and resolve conflicts where “competing” interests (real or perceived) occur.
- It enables consideration of co-benefits from environmental management actions. Examples are shown in Table 1.

Delivering FILLM into the Future

The overriding conclusion is that the guiding principle for environmental management should be a commitment to a framework for integrated land and landscape management within a holistic systemic perspective. It must be based on a recognition that all actions on the planet have planetary consequences, not only for our water resources, but also for ecosystems and our climate.

It is against this background that An Fóram proposes the following:

1. That the Framework for Integrated Land and Landscape Management (FILLM) becomes the overarching framework for environmental management, as a means of connecting and achieving, for instance, the UN Sustainability Goals for 2030 and the Water Framework Directive, Urban Waste Water Treatment Directive, Habitats Directive, Floods Directive, Drinking Water Directive, the European Landscape Convention, climate change adaptation and mitigation, soil conservation, and sustainable food production and land-use planning requirements.
2. That public engagement on a particular component of the environment, such as river basin management planning or ecosystem protection and enhancement or GHG emission reduction, should include consideration of all the environmental components in a holistic manner.
3. That the Programmes of Measures for water resources, biodiversity and climate change adaptation and mitigation should not be considered in a siloed manner, but as measures and actions that can achieve more than one objective and benefit as a means of optimising efficiency and effectiveness in terms of resource use and environmental outcomes, and as a means of considering trade-offs where synergies are not feasible.
4. That all relevant public bodies with an environmental remit, such as An Fóram Uisce, DHPLG, DAFM, EPA, NPWS, LAWPRO, IFI, GSI and local authorities, adopt the FILLM approach, including the multi-disciplinary and multi-organisational implications, in their vision and environmental management work, as a means of achieving optimum efficiency and effectiveness.
5. That resources are allocated to allow these recommendations to be enabled.

Table 1: Illustration of the range of environmental benefits provided by different farming and forestry practices within the Framework for Integrated Land and Landscape Management

Management option to address pressures	Water quality	Biodiversity	Flood mitigation	Soil conservation	Landscape	Climate Change Mitigation	Climate Change Adaptation
Creation of buffer strips, e.g. riparian zones, grass margins.	●	●	○	●	○	●	○
Planting of clover and multi-species grasses	●	●	-	●	-	●	-
Planting hedges alongside watercourses & across slopes	●	●	○	●	○	●	○
Liming of mineral soil to ensure optimum pH	●	-	-	●	-	●	○
Agroforestry	●	●	○	●	○	●	○
Reforestation with native species	●	●	●	-	○	●	○
Interception ponds and constructed wetlands	●	●	○	○	●	●	●
Rewetting peatlands	●	●	○	-	○	●	●



= Management option contributes directly to an environmental benefit



= Management option contributes indirectly to an environment benefit

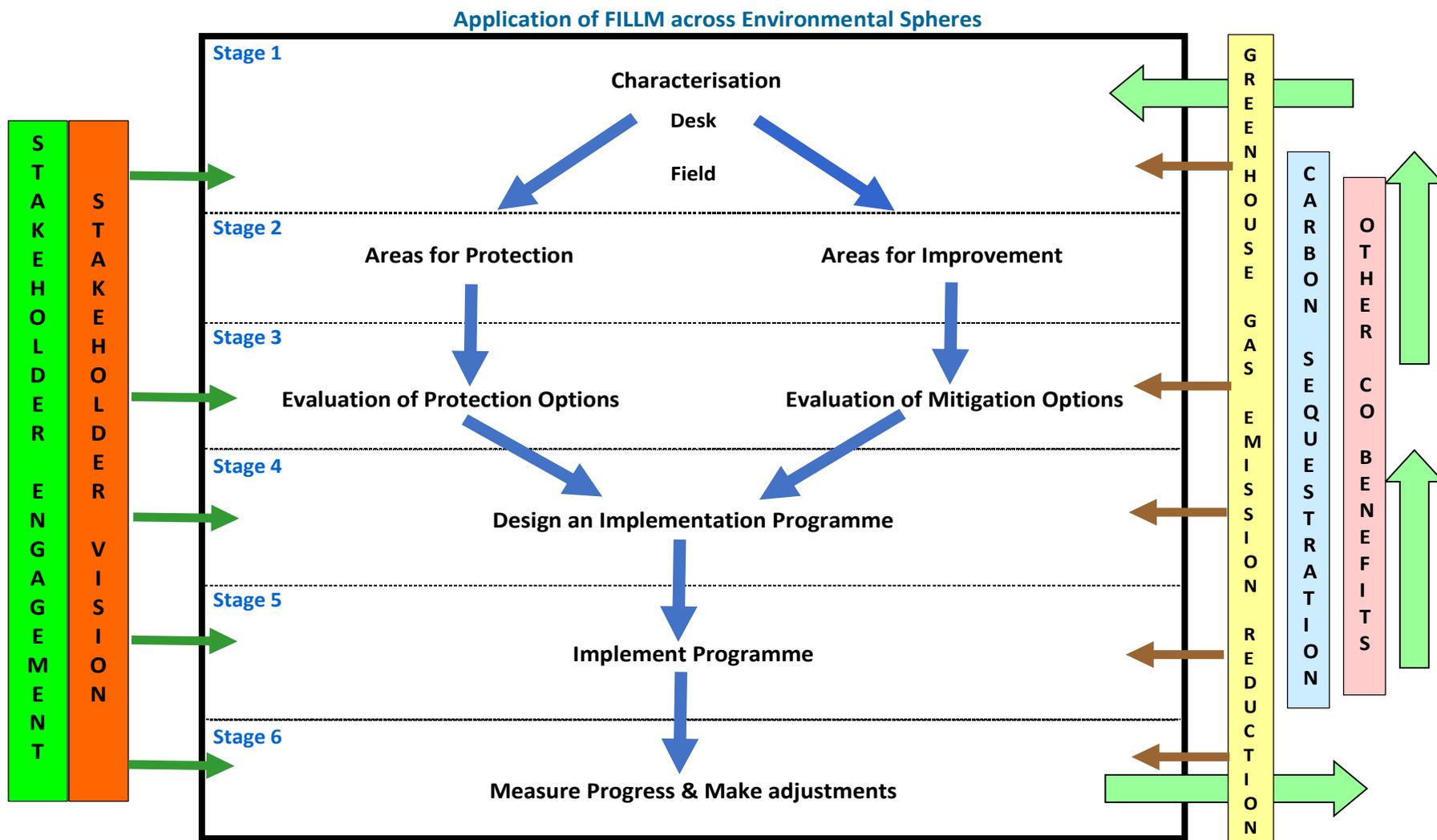


Figure 3: Components of the reconceptualised Integrated Catchment Management (ICM) approach as a Framework for Integrated Land and Landscape Management (FILLM) aimed at achieving Water Framework Directive, Urban Waste Water Treatment Directive, Drinking Water Directive, Floods Directive and Habitats Directive objectives, and linking with carbon sequestration and GHG emission reduction

Appendix 1: National and international policies and recommendations for an integrated approach to environmental management

A more holistic and integrated approach that links all the environmental components, as well as the interaction with human activities, is advocated in several national and international policies and recommendations.

- The UN Sustainability Goals (SDGs) for 2030⁷, which are a policy driver for sustainable management of the Earth's resources, implicitly recognises the co-dependence of many policy areas.
- The EU vision of 'living well, within the limits of our planet' by 2050 recognises that Europe's economic prosperity and wellbeing is intrinsically linked to protecting, conserving and enhancing the Union's natural capital.⁸
- Looking through the lens of sustainable food production rather than environmental protection, a European Environment Agency Report 'Food in a Green Light (2017)⁹, under a heading 'Food Connects' advocates, '*a systems approach to sustainable food which addresses both terrestrial and marine food production in an integrated manner and analyses resource use and environmental impacts, as well as actors and governance*'.
- The proposed European Green Deal¹⁰ that plans, among other things, i) a 'climate neutral' Europe by 2050; ii) zero-pollution whereby the objective for air, soil or water is to reach a "pollution-free environment" by 2050; iii) a new biodiversity strategy that includes measures to tackle soil and water pollution as well as a new forest strategy; and iv) a farm to fork strategy that includes plans to significantly reduce the use of chemical pesticides, fertilizers and antibiotics.
- The nine objectives for the future common agricultural policy (CAP)¹¹: i) to ensure a fair income to farmers; ii) to increase competitiveness; iii) to rebalance the power in the food chain; iv) climate change action; v) environmental care; vi) to preserve landscapes and biodiversity; vii) to support generational renewal; viii) vibrant rural areas; ix) to protect food and health quality.
- The DAFM Ag-Climate Public Consultation Report (2019)¹² points out that achieving the measures as set out in the GHG Marginal Abatement Cost Curve (MACC) for agriculture for 2021-2030 (methane and nitrous oxide abatement) will not only lead to a reduction in carbon emissions, but there will be co-benefits for other environmental priority areas – water quality and biodiversity.
- Dairy Sustainability Ireland (a collaborative project with An Bord Bia, DAFM and a number of Ireland's dairy processors) in their Ag-Climate submission¹³ suggested that the Agricultural Sustainability Support and Advice Programme (ASSAP) programme should

⁷ <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

⁸ <https://ec.europa.eu/environment/pubs/pdf/factsheets/7eap/en.pdf>

⁹ <https://www.pbl.nl/en/publications/food-in-a-green-light>

¹⁰ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

¹¹ https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap/key-policy-objectives-future-cap_en

¹²

<https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/ClimateandAirRoadmapfortheAgriculturalSector141119.pdf>

¹³ <http://icos.ie/wp-content/uploads/2013/12/Dairy-Sustainability-Ireland-Submission-Ag-Climate.pdf>

be expanded and widened to incorporate climate, biodiversity, and ammonia as well as water in light of the common elements of improvement strategies for each so that there is an integrated approach to on-farm sustainability. They also suggest that the LAWPRO and climate community programmes should be integrated at local level. Their submission states *“It is recognised that in the implementation of low carbon strategies, there are significant co-benefits for other environmental priority areas including ammonia, water quality, and bio-diversity as well as co-benefits for soil productivity improvement which will improve farm productivity and farm incomes. As set out earlier, a new integrated on-farm sustainability approach is suggested incorporating all of these objectives.”*

- The ‘Functional Land Management (FLM)’ concept which ‘assesses the functional capacity of the soil and land to deliver primary productivity, water purification and regulation, carbon cycling and storage, habitat for biodiversity and recycling of nutrients’.¹⁴
- The National Landscape Strategy 2015-2025, which states in the Forward *“Our landscape can and will continue to accommodate multiple uses, and be appreciated in many different ways. However to have a sustainable society, environment and economy, we need to both embrace change and to manage our landscape in a considered, integrated and planned way. Using the parameters of the European Landscape Convention¹⁵, our challenge now is for a sustainable future, achieving a balance between our social, cultural and economic needs and our environment and landscape. The National Landscape Strategy is a first step in confronting this challenge.”*¹⁶
- The seven key environmental actions in the EPA State of the Environment Report (2016)¹⁷ are considered under the following headings: i) Environment and Health & Wellbeing; ii) Climate Change; iii) Implementation of Legislation; iv) Restore and Protect Water Quality; v) Sustainable Economic Activities; vi) Nature & Wild Places; and vii) Community Engagement. These are linked to the UN SDG goals and while the actions are listed as individual items, the point is made in the Report that many are linked and that the integration of actions across these areas will be important for the delivery of environmental protection and sustainable development.

¹⁴ O’Sullivan, L., Wall, D., Creamer, R., Bamba, F and Schulte, R.P.O. (2017). Functional land management: bridging the think-do-gap using multi-stakeholder science policy interface. *Ambio*. Available at this link: <https://link.springer.com/article/10.1007/s13280-017-0983-x>

¹⁵ <https://www.coe.int/en/web/landscape>

¹⁶ <https://www.chg.gov.ie/app/uploads/2015/07/N-Landscape-Strategy-english-Web.pdf>

¹⁷ http://www.epa.ie/pubs/reports/indicators/SoE_Report_2016.pdf

Appendix 2: The Integrated Catchment Management Approach

Integrated Catchment Management (ICM) is a generic approach that provides the overarching framework for the implementation of the Water Framework Directive (WFD) and the philosophy for water management – achieving water body status objectives, drinking water protection and flood mitigation – and aquatic ecosystem protection in Ireland.

This approach is being used as a means of achieving successful implementation of the WFD for the following reasons:

- It is catchment-based, aiming not only to provide the hydrological/hydrogeological basis for water resources management, but also to connect people with their local stream, river, lake, coastal water, spring or borehole.
- It employs a broad range of ‘tools’ in its ‘toolkit, starting with local participation and partnership to encourage practice change, catchment characterisation, the implementation of appropriate measures and incentivising actions and, finally, inspections and enforcement.
- It integrates all water types and all relevant disciplines.
- It provides for ‘characterisation’ of the catchment. This, in turn, assists in the identification of the causes and sources of pollution, critical source areas (CSAs) and possible management strategies and mitigation options.
- It requires close collaboration between relevant public bodies.
- It requires a combination of ‘bottom-up’ and ‘top-down’ approaches.
- It involves awareness-raising, engagement and consultation with local communities.
- It presents a ‘new’ vision of a healthy, resilient, productive and valued water resource that supports vibrant communities.

ICM, as set out and used to-date, consists of a number of steps, which are shown in Figure 4, and a number of components or ‘tools’ as shown in Table 2.

The Framework for Integrated Land and Landscape Management takes the main components of ICM (Figure 4), changes and reorients them (Figure 3) based on lessons learned, and re-applies the approach using catchments as the landscape units for management and protection of our natural capital – the ecosystems, geosystems and atmospheric systems illustrated in Figure 2.

While FILLM is an overarching approach for environmental management, as illustrated in Figure 3, it encompasses the slightly amended and reconfigured ICM, which is a necessary approach for successful water resources management and river basin management planning in Ireland.

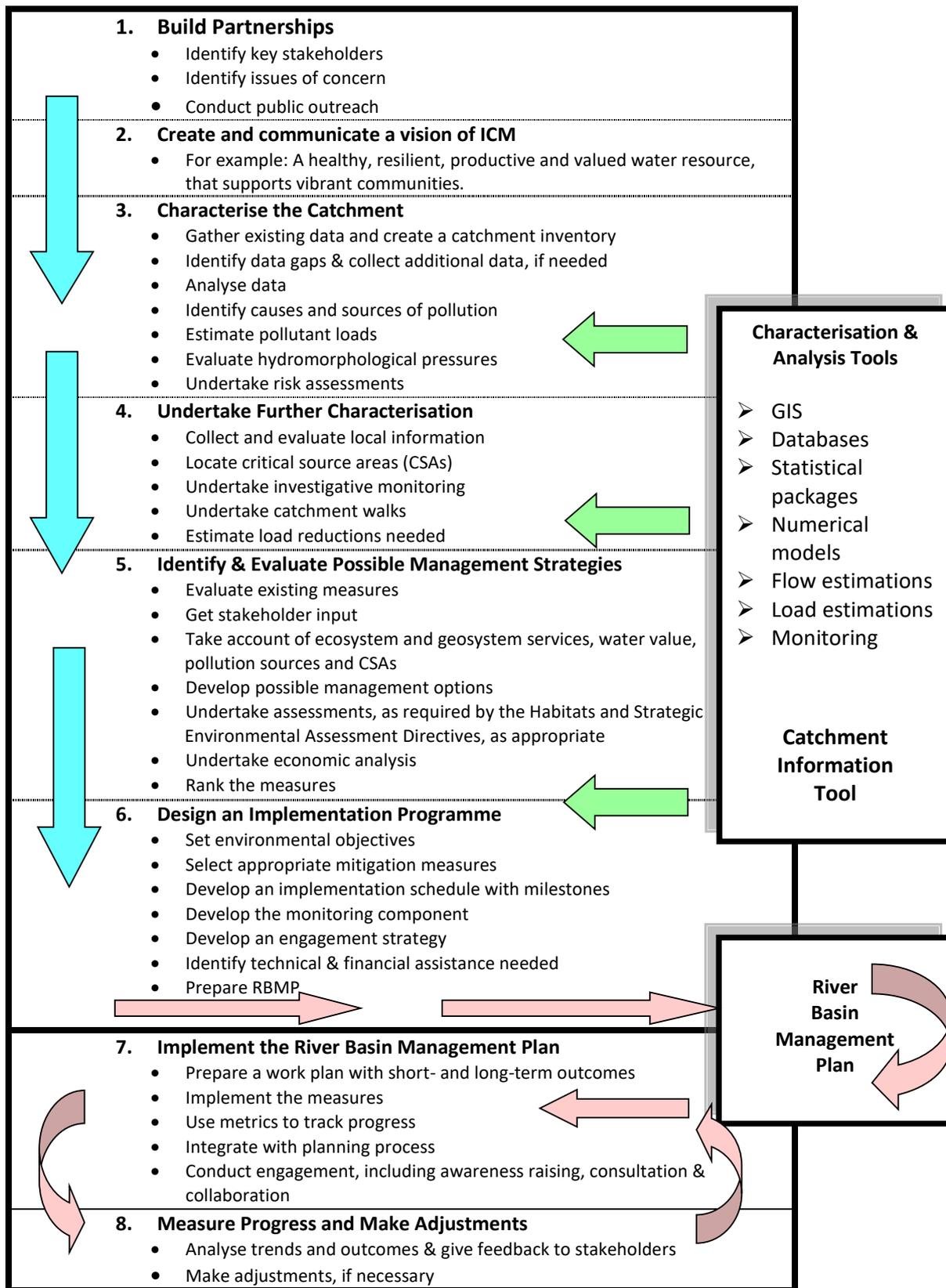


Figure 4: Steps in the integrated catchment management process. (Copied from Daly, Archbold and Deakin (2016). Paper available at this link: <http://www.jstor.org/stable/10.3318/bioe.2016.16>.)

Table 2: The 'Toolkit' for the ICM Approach

	Tools	Challenges/likelihood of success
<p>Participation & Partnership</p>  <p>Enforcement</p>	<p>A vision</p> <ul style="list-style-type: none"> ➤ 3-D integrated catchment science <ul style="list-style-type: none"> ➤ Catchment management ➤ Both science and people ➤ Healthy and vibrant communities. <p>Public engagement</p> <ul style="list-style-type: none"> ➤ Awareness raising ➤ Sharing knowledge ➤ Collaboration & engagement with local communities <p>Characterisation at catchment scale</p> <ul style="list-style-type: none"> ➤ Bio-physical (hydrogeology, biology, hydrochemistry, etc.) <ul style="list-style-type: none"> ➤ Monitoring ➤ Location of <i>significant pressures</i> ➤ Evaluation of impact of <i>significant pressures</i> ➤ Analysis using SPR approach (detailed evaluation of hydrochemistry, pollutant loading, biological indicators, etc.) <p>Characterisation at local scale</p> <ul style="list-style-type: none"> ➤ 'Walking the catchment' ➤ Location of critical source areas (CSAs) ➤ Decisions on measures/actions <p>Programmes of measures</p> <ul style="list-style-type: none"> ➤ Best Management Practices (BMPs) <ul style="list-style-type: none"> ➤ Measures targeted spatially <ul style="list-style-type: none"> ➤ Costed and prioritised ➤ A focus on outcomes ➤ Input of local knowledge ➤ Local participation <p>Incentives</p> <ul style="list-style-type: none"> ➤ Greening of the CAP ➤ Grants for native woodlands <p>New/Upgrading infrastructure</p> <p>Inspections</p> <p>Farming; DWWTSs; UWWTPs; Drinking water audits; IPPC inspections</p> <p>Court/loss of money</p> <p>Policy changes/new Regulations</p> <p>Over-arching requirement</p> <ul style="list-style-type: none"> • Modelling, GIS, databases, communications 	<p>A new vision. If approached properly, a high likelihood of success. [<i>"Catchments: connecting land, water and people from the mountains to the sea"</i>]</p> <p>Complex area & resource intensive. Means of achieving successful outcomes unclear. Essential, for long term results.</p> <p>Multi-disciplinary. Must be scientifically defensible and catchment specific. More than just monitoring. Produces the information needed as the basis for catchment walks.</p> <p>Resource intensive. Essential as a means of choosing the optimum mitigation options.</p> <p>Some measures/actions costly. Must be prioritised and outcome oriented. These are the means of achieving water quality outcomes.</p> <p>Incentives need to be focussed on CSAs and relevant pressures</p> <p>Continued investment needed</p> <p>Needs to be risk-based. Necessary, particularly when other 'tools' are not effective.</p> <p>The last resort!</p> <p>Essential, but challenging and potentially slow to achieve.</p>

Copied from LAWPRO, 2020. Available at this link: <http://lawwaters.ie/technical-resources/>

