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Understanding the integration of ecosystem services and natural capital in Scottish policy

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Supplementary Material: policy texts reviewed and content analysis

Notice

The present document provides material detailing the analytical operations described in the article. For each of the eight sectors of Scottish policy assessed in the article, a complete list of the texts reviewed is provided, along with a summary table highlighting the results of content analysis. Those findings are then followed by a short overall assessment of the policy area. Note that this third subsection is absent from the forestry section, since a more detailed version of such an assessment features in the article for this sector.

Section I adds three types of documents that were used in the assessment. First comes a list of texts deemed to have a “horizontal” significance in Scottish policy, in the sense that they spell out principles, norms and processes relating to all the sectors considered in the study (I.1). Then key European documents directly referred to in the analysis have also been included (I.2). Finally, reports documenting the land-use regional pilots mentioned to in the article as a tentative foray into actual implementation are provided as well (I.3).

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A. Forestry

A.1. Policy documents reviewed

Forestry Commission (2011) The UK Forestry Standard (3rd edition). Report, Edinburgh: Forestry Commission.

——— (2014) Woodland Carbon Code: Requirements for voluntary carbon sequestration projects (version 1.3). Report, Edinburgh: Forestry Commission

Forestry Commission Scotland (2005) WIAT: Woods in and Around Towns. Report, Edinburgh: Forestry Commission Scotland.

——— (2008b) Scotland's Woodlands and the Historic Environment. Report, Edinburgh: Forestry Commission Scotland, August.

——— (2008c) Scottish Programme for Protected Woodland Sites. Report, Edinburgh: Forestry Commission Scotland.

——— (2008d) Woods for Nature: Our Biodiversity Programme 2008-2011. Report, Edinburgh: Forestry Commission Scotland, July.

——— (2009a) The Scottish Government's Policy on Control of Woodland Removal. Report, Edinburgh: Forestry Commission Scotland, February.

——— (2009b) Supporting Business Development: The role of Forestry Commission Scotland. Report, Edinburgh: Forestry Commission Scotland, March.

——— (2009c) Woods for Health. Report, Edinburgh: Forestry Commission Scotland, June.

——— (2009d) Woods for Learning. Report, Edinburgh: Forestry Commission Scotland, December.

- (2010b) National Forest Land Scheme. Report, Edinburgh: Forestry Commission Scotland, November.
- (2011a) Woods in and Around Towns: Phase III Next steps. Report, Edinburgh: Forestry Commission Scotland, May.
- (2011b) The Scottish Forestry Strategy: Description of indicators (Updated December 2011). Edinburgh: Forestry Commission Scotland, December.
- (2012) Woods for Nature - next steps. Report, Edinburgh: Forestry Commission Scotland, March.
- (2013a) Forestry Commission Scotland: Framework document for Forest Enterprise Scotland. Edinburgh: Forestry Commission Scotland.
- (2013b) Woods for Learning Action Plan 2013-2015. Report, Edinburgh: Forestry Commission Scotland.
- (2013c) Woods for Health Action Plan 2013-2015. Report, Edinburgh: Forestry Commission Scotland.
- (2013d) Climate change programme. Edinburgh: Forestry Commission Scotland.
- (2015a) Guidance to Forestry Commission Scotland staff on implementing the Scottish Government's Policy on Control of Woodland Removal. Edinburgh: Forestry Commission Scotland, March.
- (2015b) The Scottish Forestry Strategy: Progress indicators published May 2015. Report, Edinburgh: Forestry Commission Scotland, May.
- (2015c) Woodlands for water and the Forestry Grant Scheme. Report, Edinburgh: Forestry Commission Scotland, June.
- (2015d) The Scottish Forestry Strategy: Progress report (2014-15) and future implementation (2015-18). Edinburgh: Forestry Commission Scotland.

McGowan, P, and Dingwall C (2011) Practice Guide: Conserving and managing trees and woodlands in Scotland's designed landscapes. Report for Forestry Commission Scotland, Edinburgh.

Rees, T, and Turner, L. (2011) Historic Environment Information & Advice for Forest and Woodland Managers in Scotland. Report, Edinburgh: Forestry Commission Scotland, 7 April.

Scotland (1999) *The Environmental Impact Assessment (Forestry) (Scotland) Regulations 1999*. Elizabeth II, 1999 No. 43. London: The Stationery Office.

Scottish Government (2012) Response to the report of the Woodland Expansion Advisory Group. Edinburgh: Scottish Government, October.

——— (OnlineB) Forestry Grant Scheme. Website Section. Accessed July 13 2015. Available at: <https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/forestry-grant-scheme/>

Woodland Expansion Advisory Group (2013) Implementing the response to the recommendations. Report, WEAG, June.

United Kingdom Woodland Assurance Standard (2013) *UKWAS: United Kingdom Woodland Assurance Standard. Third edition (version 3.1)*. Edinburgh: United Kingdom Woodland Assurance Standard.

A.2. Content analysis: summary table

Document	Conceptual integration	Operational integration
The Environmental Impact Assessment (Forestry) (Scotland) Regulations 1999	No specific integration of the NC/ES concepts. Yet door opened in Schedule 4, listing Environmental factors as follows: (a) Human beings, fauna and flora; (b) soil, water, air, climate and the landscape; (c) material assets and the cultural heritage; and (d) the interaction between the factors mentioned in paragraphs (a) to (c) above.	EIAs are mainly protective measures allowing in this case Forest Commissioners to reject development on the grounds of their supposed consequences on the environment.
National Forest Land Scheme (launched in 2005, current version from 2010)	No mention to NC/ES but refers to the “sustainability of the management proposed” as related to the UKWAS, which does implicitly (see below, p. 15). Emphasis on “public benefits”.	Community acquisition of National Forest Land conditional to a demonstrable commitment to sustainable development and the avoidance of detrimental impacts on the National Forest Estate and its management (pp. 4, 15).
WIAT: Woods in and Around Towns (2005), WIAT Woods in and Around Towns: Phase II (2008), Woods in and Around Towns: Phase III Next steps (2011)	Rationale behind phase I clearly oriented toward the delivery of benefits associated with woodlands, especially the contribution of “environmental capital” to social capital (pp. 3-5, 6). Proto-concepts and notions related to NC/ES mentioned in the programme objectives (p. 4): “increase recognition of the benefits of urban woods and greenspace networks”, “improve the quality of existing urban woods for people and wildlife”, “increase the creation of woods in green networks around towns, on derelict and underutilised land, and on land associated with new development”. More explicit terms in phase II : “green infrastructure” (pp. 9-10, 11, 14), multi-purpose “forestry resource” (p. 7), “woodland benefits” (p. 11). Benefits yet not linked to ecosystem functioning, emphasis put on human agency in the delivery of services (pp. 6, 11). Explicit yet uncomprehensive reference in the available phase III documentation (limited to environmental benefits, p. 17), as a mere part of sustainable forest management defined as “the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems” (p. 4).	Phase I outlines instruments: development of specific funding through the Scottish Forest Grant Scheme (WIAT “Challenge fund”, spatial targeting, and direct management by FCS, pp. 8-11). Phase II : integration with the Forestry Strategy, information/ guidance/research/advocacy, regulation through the involvement of FCS in planning, funding (same as phase I, plus “Forestry for People Challenge Fund”), and direct intervention (pp. 13-14). * Forestry Challenge Funds are now closed to application after the Forestry Challenge Funds (Scotland) Regulations 2008 have been revoked by the Rural Development (Scotland) Regulations 2015. WIAT funding is now part of the SRDP Forestry Grant Scheme.
The Scottish Forestry Strategy 2006	The Strategy oscillates between emphasising the role of forestry practices in delivering benefits to society and recognising that of forest ecosystems themselves. Biodiversity presented as an end rather than a mean, attempts to link it to concrete	Sustainable forest management standards : aligned on UK-wide standards (p. 53, see UKWAS). Information and advice : provided by the Forestry Commission and public services (pp. 54, 57).

	<p>services remaining limited and vague in their definition (pp. 19, 47, 69). The same is true for “environmental quality”, only linked to a reduced number of social and economic benefits (tourism, water and air purification, p. 43). These sets of objectives are clearly separated from the sections relative to climate change and the timber industry. On the other hand proactive approach focusing on “enhancement” outlined throughout the document, implicitly relying on supporting the ecosystem functions: “green’ technology” (p. 19) or “forest restructuring” (p. 27).</p> <p>Community engagement and access (pp. 32-41): The way in which the Strategy frames forestry issues also considers the ‘delivery’ and distribution of the benefits procured by woodlands</p> <p>Focus on “sustainable forest management”, defined as: the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems” (p. 66).</p>	<p>Conditional incentives from Scottish environmental agencies and through European payment schemes (p. 56).</p> <p>3.4 Implementation process (p. 59): FCS responsible for reporting on progress and monitoring, as well as preparing “short to medium-term implementation Plans” in consultation with the Scottish Forestry Forum.</p>
<p>Woods for Nature: Our Biodiversity Programme 2008-2011 (2008) and following/related policy documents: Scottish Programme for Protected Woodland Sites (2008); Woods for Nature - next steps (2012)</p>	<p>The 2008 Programme does not use the ES concept and merely connects biodiversity with recreation (pp. 21-22). The only other reference to “biodiversity benefits” is an elusive call to further research (p. 23). The follow-up 2012 report explicitly resorts to the concept without expanding on it.</p>	<p>Both 2008 documents focus on protection and habitat enhancement/restoration, as well as public access.</p> <p>The 2012 revised action plan builds on ES knowledge to promote targeted proactive measures including diversifying productive industrial plantations, developing large-scale plans and habitat networks, as well as integrating biodiversity into forestry support measures (pp. 4-5).</p> <p>* Guidance and action notes on six key woodland species have also been issued (capercaillie, black grouse, red squirrel, pearl-bordered fritillary, chequered skipper butterfly and juniper).</p>
<p>Scotland’s Woodlands and the Historic Environment (2008) and following/related policy documents: Historic Environment Information & Advice for Forest and Woodland Managers in Scotland (2011), Practice Guide: Conserving and managing trees and woodlands in Scotland’s designed landscapes (2011)</p>	<p>No explicit mention in the 2008 policy, but extensive definition of the “historic environment” (p. 7): “The historic environment goes beyond the definition of ‘the built heritage’ in the Stirling Charter and extends to the present day. Our whole environment, whether rural or urban, on land or under water, has a historic dimension that contributes to its quality and character. It has been shaped by human and natural processes over thousands of years [...] In terms of Scotland’s forests and woodlands, not only does the historic environment include all evidence within and associated outside a woodland, but it can also embrace wooded landscapes and the trees</p>	<p>Focus in damage prevention through Environmental Impact Assessment in the 2008 (p. 12) and 2011 “Information and Advice” (p. 15) documents.</p> <p>The 2011 Guide provides advice and promotes good practice, such as including natural features and forestry practices in Conservation Management Plans (p. 18).</p>

	<p>themselves.” Also implicit recognition of cultural services in reference to the objectives of the Forestry Strategy and the “benefits” Scottish forests deliver (p. 10, 13): “Value the cultural history and meaning of forests, woodlands, trees and the historic environment”, “Encourage the development of living heritage and the arts in woodlands”, “Enhancing enjoyment and maintaining the character of rural landscapes”.</p> <p>Idem in the 2011 “Information and Advice” document, with further details regarding the historic value of natural features: “Types of Historic Environment sites” including “managed woodland: hedgerows, coppices, pollard trees, veteran trees, wood pasture and policy woodland”, and “palaeo-environmental deposits: raised mires, mire and blanket bog” (pp. 8-9), “The historic value of existing trees and woodland (such as historic trees and planted elements of designed landscapes) should also be considered” (p. 36).</p> <p>The 2011 Practice Guide resorts to the concept of ES but only in relation to the Forestry Commission missions (p. 44). The Guide promotes “– Continuous cover forestry (CCF)” and “a holistic approach to forest management – CCF regards the whole woodland ecosystem as the ‘production capital’. This includes the soil, the forest micro-climate, associated fungi, flora and fauna, as well as the trees themselves. Management for timber production is directed towards the creation, maintenance and enhancement of a functioning ecosystem rather than the periodic creation and removal of individual crops of trees” (p. 32).</p>	
<p>Supporting Business Development: The role of Forestry Commission Scotland (2009)</p>	<p>No specific integration, repeated mentions to “forestry benefits” (pp. 6-7, 9-10) but no emphasis on their multiplicity and limited scope. Forestry rather than woodlands as the key theme (p.2), focus on industrial/economic dimensions: “The social and environmental aspects of forestry offer business development opportunities. However community forests (including Woodlands In and Around Towns) are not a key focus of this strategy” (p. 5).</p>	<p>Support through research and advice, partnerships and grants promoted by development programmes, direct intervention of FES (pp. 6-8), but again centred on forestry as an economic activity.</p>
<p>The Scottish Government's rationale</p>	<p>Explicit but restrictive use of the ES concept, other ‘benefits’ being listed next to it but</p>	<p>N/A</p>

<p>for woodland expansion (2009)</p>	<p>apparently not included in the definition (p. 6): “The Strategy identifies a number of woodland creation priorities for Scotland:</p> <ul style="list-style-type: none"> ▪ Helping to tackle greenhouse gas emissions. Carbon sequestration, timber and fuel production. ▪ Restoring lost habitats and adapting to climate change. Forest habitat networks and new native woodlands. ▪ Helping to manage ecosystem services. Sustainable flood management, and protection of soil and water resources. ▪ Underpinning a sustainable forest products industry. Consistent and reliable timber supply for timber processing and wood fuel investments. ▪ Supporting rural development. Supporting local businesses and farm diversification. ▪ Providing community benefits. Provision of welcoming and well-managed woodlands in and around communities and where health and community need is greatest. ▪ Enhancing urban areas and improving landscapes. Improving derelict, underused and neglected land, improving degraded or unsightly environments and diversifying farmed landscapes.” 	
<p>The Scottish Government’s Policy on Control of Woodland Removal (2009), completed by the Guidance to Forestry Commission Scotland staff on implementing the Scottish Government’s Policy on Control of Woodland Removal (2015)</p>	<p>The SG’s policy implicitly builds on the provision of services and disservices by woodlands. The following Guidance explicitly uses the term, and introduces a time criteria based on the slow full establishment of some ecosystem services (p. 3).</p>	<p>Acceptability criteria for woodland removal (pp. 6-7, 16-17): Enhancing priority habitats and their connectivity, enhancing populations of priority species, enhancing nationally important landscapes and historic environments, improving conservation of soil and water resources, public safety, helping Scotland mitigate or adapt to climate change, sustainable economic growth and rural/community development, Scotland as a tourist destination, increasing the quality of Scotland’s woodland cover.</p>
<p>Woods for Learning (2009), Woods for Learning Action Plan 2013-2015 (2013)</p>	<p>No explicit reference, but outline of specific educational benefits in terms of health, recreation, economy through individual development, community development (pp. 9-10). Reference to forests as “our national green resource” (p. 3).</p>	<p>Action plan centred on the development of greenspaces a learning environment through partnerships and staff training, and the possibility to “explore the potential, and possibly develop, a ‘Greening the School Estate’ pilot in a LA”.</p>
<p>Woods for Health (2009), Woods for Health Action Plan 2013-2015 (2013)</p>	<p>Policy relying on the health and social benefits provided by the access to woodland. Increasing accessibility as an important underpinning them. Added value of ES implicitly recognised by mention to “green networks” (p. 11) and “greening up the NHS estate” (p. 20).</p>	<p>Partnership between SFC, SNH and the NHS, training of professionals, development of green infrastructure.</p>
<p>The right tree in the right place: Planning for</p>	<p>Explicit reference (p. 54): “Delivering ecosystem services as part of broader</p>	<p>Section 3 (pp. 12-21): introduction of local Forestry and Woodland Strategies to be</p>

<p>forestry & woodlands (2010)</p>	<p>landscape/catchment approaches to natural resource management. Examples include:</p> <ul style="list-style-type: none"> • creating new, and managing existing, woodlands as part of natural flood management schemes (for example, through the strategic placement of floodplain woodlands, through targeted actions to help 'slow the flow; within existing woodlands, and as part of green networks for sustainable urban drainage schemes); • helping to protect water and soil resources against future climatic extremes (for example, through appropriate tree planting to stabilise slopes and river banks or to regulate water temperatures in vulnerable watercourses); • managing diffuse and point source ammonia emissions." 	<p>integrated with other planning frameworks. These are to be based on consultation and available data, implying an SEA if needed.</p> <p>Section 4 (pp. 22-55): list ways in which Forestry and Woodland Strategies feed into local planning outcomes.</p> <p>Annex B (pp. 66-68): provides planning authorities with available data sets and tools to elaborate Strategies.</p>
<p>The UK Forestry Standard (2011)</p> <p>* Supported by a series of seven Guidelines covering specific topics in detail (biodiversity, climate change, historic environment, landscape, people, soil, and water)</p>	<p>Concept of ecosystem service in the introduction (p. 4), before being defined in detail and comprehensively in relation with the notion of ecosystem approach (pp. 8-9).</p>	<p>Requirements (pp. 24-48) and guidelines (pp. 50-84) promoting proactive forest management practices overall, multiple references not only to protection but also to enhancement. Both sections comprehensive in their scope, divided into the following subsections covering a wide range of forest es: general forestry practice, forests and biodiversity , forests and climate change, forests and historic environment, forests and landscape, forests and people , forests and soil, forests and water.</p>
<p>Woodland Expansion policy: Report of the Woodland Expansion Advisory Group to the Cabinet Secretary for Rural Affairs and Environment, Richard Lochhead MSP (2012), Response to the report of the Woodland Expansion Advisory Group (2012), Implementing the response to the recommendations (2012)</p> <p>* The recommendations presented in these documents have led to the publications of a number of related guidance and charters: Guidance about woodland creation on agricultural land (2013); Prospects for productive woodland in Scotland: Insights from stakeholders (2013); Customer's Charter: SRDP Process for Forestry Commission Scotland (2014); Technical Advice on</p>	<p>Initial report: comprehensive list of the ecosystem services associated with woodlands; even though the categorisation used can be discussed (carbon sequestration is for instance classified as both regulating and supporting, pp. 26-37). Concept explicitly used in the Cabinet Secretary's response, implicitly referred to in the subsequent WEAG report.</p>	<p>Taken together, these 3 documents articulate an action plan based on 24 recommendations presented in the first WEAG report. The Cabinet Secretary's response details a corresponding action plan, translated into implementation deliverables in the second WEAG document.</p> <p>Recommendations 1, 2: woodland creation to be supported by UK forestry standards and guidelines as well as government grants to "deliver multiple benefits"</p> <p>Recommendations 3-5: encouraging woodland creation at the local level through the promotion of the different ecosystem services forests can deliver at the local/landscape/ regional scale. Connections with the Woods In and Around Towns Initiative and land use policy through local Forestry and Woodland Strategies as well as pilot projects.</p> <p>Recommendations 6-8, 10, 11: harmonisation of CAP and SRDP funding with forestry policy objectives, including woodland expansion and its multi-purpose approach.</p> <p>Recommendations 9, 12: engage with stakeholders through consultation and</p>

<p>WEAG Recommendation 10: Integrating woodland management and farming (2014); Advice for regional and sub-regional forest planning (2015)</p>		<p>advice.</p> <p>Recommendation 13: increased integration of woodland expansion with other SG policies, namely flood control, biodiversity, deer management, climate change and farming.</p> <p>Recommendations 14, 15: promotion of integration and co-operation at the landscape scale using SDRP grants, higher education</p> <p>Recommendations 16, 17: promotion of sustainable forestry to private landowners through the Woodland Carbon Code and related carbon calculators.</p> <p>Recommendations 18, 19: coordination of forest expansion effort with existing woodland enhancement and removal control (SRDP, promotion of exemplar cases).</p> <p>Recommendations 20-23: promotion of public and community engagement (tenant farmers/landowners co-operation, crofter forestry, Public Engagement Toolbox)</p> <p>Recommendation 24: progress reporting as part of the Land Use Strategy monitoring.</p>
<p>Forestry Commission Scotland: Framework document for Forest Enterprise Scotland (2013 revision)</p>	<p>Explicit reference to ES in FES roles (p. 3): “Landscape-scale management for biodiversity and ecosystem services”; “The Strategic Directions document also indicates that the Estate will be managed according to six aspirations, so that it is: [...] <u>Treasured</u> as a multi-purpose resource that sustains livelihoods, improves quality of life, and offers involvement and enjoyment” (emphasis in original).</p>	<p>“Sustainable land management” (pp. 3-4): Key Activities including land management planning, timber harvesting, restocking, forest protection and maintenance, deer management. Strategic Goals in link with SG climate change targets, Land Use Strategy, National Strategic Directions, Forest District Strategic Plans and Land Management Plans.</p> <p>“Social and environmental outputs” (p. 5): Key Activities including management of ‘national treasures, visitor zones and urban woodlands, provision of access and recreational opportunities, protection and enhancement of priority species/woodland and open habitats and mosaics, protection and interpretation of cultural heritage assets. Strategic Goals related to heritage, recreation and conservation, in relation with engagement strategies and biodiversity policy.</p> <p>Capital investment (p. 5) includes woodland expansion. Sustainable forest management listed as the first “Operating principle” (p. 6).</p>
<p>Climate change programme (2013)</p>	<p>No explicit reference, yet the objectives set show an implicit understanding of the concept.</p> <p>Objective 1: “Promote woodland creation that fits with broader land use, and minimise the loss of woodland”</p> <p>Objective 2: “Enhance land-based carbon stocks and increase the use of wood and</p>	<p>Objectives to be met by integrating them in other FCS policies (see rest of the table): grants and regulations, research, demonstration, strategic land use planning, direct management of the NFE, training and guidance, monitoring and surveillance, communications and public engagement.</p>

	<p>timber [...]As well as continuing to promote sustainable forest management (being clear how this is affected by a changing climate), we need to better understand the greenhouse gas dynamics of forests and soils, including peatlands.”</p> <p>Objective 4: “Help forest managers to adapt forestry practice to make forests more resilient to changing conditions [...] We will provide advice to forest managers to improve their capacity to adapt their forest management, which will include encouraging a sector-wide move towards planning and managing well-structured and diverse forests that can better withstand change and extreme events. We will develop our understanding of the impacts of climate change on biodiversity, and in priority native woodland habitats we will promote actions to facilitate adaptation including encouraging natural regeneration, increasing native woodland creation and developing forest habitat networks. We will also work to halt the loss and fragmentation of existing priority habitats.”</p> <p>Objective 6: “Use trees and forests to reduce the risks of climate change to Scotland. Our aim is for forestry to be widely used to help communities and the wider environment to cope with the impacts of climate change, by minimising its adverse effects. We will work with other stakeholders to develop and deliver decision-making tools that identify the role of woodlands in natural flood management, and will encourage the use of trees and riparian woodland to prevent riverbank erosion and reduce thermal stress on the flora and fauna living in the water. We will promote research findings that demonstrate the role of trees and woodlands in urban climate control in Scotland, and encourage the use of trees as part of sustainable urban drainage systems. We will help forest managers to identify areas and causes of slope instability on their estates, and find site-appropriate solutions to erosion and landslide – particularly where this threatens Scotland’s transport and other built infrastructure.”</p>	
<p>The role of Scotland’s National Forest Estate and strategic directions for 2013-2016 (2013)</p> <p>* This National Strategic Plan provided the guidelines for the 10 District Strategic Plans 2014-2017.</p>	<p>Explicit and comprehensive use of the concept: “The role of the Estate can also be described in terms of the ecosystem services it has the potential to provide:</p> <ul style="list-style-type: none"> • Supporting services such as primary production, nutrient dispersal and cycling; • Provisioning services such as timber, food (farmed and wild), water, minerals, energy (hydropower, wind energy and biomass fuels); • Regulating services such as carbon 	<p>“Priorities for action” (outlined pp. 48-52) focusing woodland enhancement and sustainable forest management. Mitigation and protection measures against diseases, invasive species. Proactive stance towards carbon storage, game management, slope stability, timber, tourism, heritage, habitat conservation (uncomprehensive).</p>

	<p>sequestration and climate regulation, flood management, purification of water and air, detoxification of contaminated sites and biological reservoirs for crop pollination and pest and disease control;</p> <ul style="list-style-type: none"> • Cultural services around recreational experiences, cultural, intellectual and spiritual inspiration and scientific advancement.” 	
<p>UKWAS: United Kingdom Woodland Assurance Standard. Third edition (version 3.1) (2013)</p>	<p>No mention of the exact phrase but reference to ecological functions and “identified services and resources such as watersheds and fisheries” (p. 26) that can be “enhanced”.</p>	<p>Section 2, management planning: requirement to identify and assess “relevant aspects of the woodland resource” to be monitored and mapped (p. 14).</p> <p>Section 3, woodland design: EIA (p. 19), location and design meant to “maintain or enhance the visual, cultural and ecological value and character of the wider landscape” (p. 20).</p> <p>Section 4, operations: need to “maintain and, where appropriate, enhance the value of identified services and resources” (p. 26).</p> <p>Section 5, protection and maintenance: limitation of negative impacts on forest ecosystems.</p> <p>Section 6, conservation and enhancement of biodiversity: mainly protective measures with duty to “identif[y] areas, species and features of high conservation value [that] shall be maintained and, where possible, enhanced” (p. 36) and “action which will progressively improve the biodiversity, environmental and cultural values of plantations” (p. 40).</p> <p>Section 7, the community: concern about the accessibility and distribution of benefits and possible detrimental impacts.</p>
<p>Woodland Carbon Code: Requirements for voluntary carbon sequestration projects (version 1.3, 2014)</p>	<p>Certification scheme focusing on one ES, carbon sequestration. Wider concept not explicitly mentioned, but attention given to ‘environmental quality’ in section 4, defined as: “taking into account the wider impacts on ecosystems to ensure that no harm is done by the project and that wider benefits are created. These benefits could include improvements to wildlife habitat, air or water quality as well as flood reduction”.</p>	<p>Certification designed to provide landowners with homogeneous credentials to sell carbon units to businesses in need of offsetting.</p> <p>Section 2: lists the technical basis for project eligibility, including sound monitoring.</p> <p>Section 3: details the processes counting towards certified carbon sequestration.</p> <p>Section 4: despite encouragement towards “benefit creation” and “improvement”, instruments limited to protection (Environmental Quality statement included in the certification demand, EIA/Environmental Statement).</p>
<p>Deer Management on the National Forest Estate: Current Practice and Future Directions – 1 April 2014 to 31 March 2017 (2014)</p>	<p>Explicit reference and comprehensive understanding of NC/ES notions linked to management practices:</p> <p>“Integrated Land Management: Our deer management practices and outcomes underpin or are affected by a range of integrated land management activities. From this mix of land use and management</p>	<p>“How we manage deer” (pp. 31-43): evidence-based population control including monitoring, stalking and culling.</p>

	<p>regimes we provide a range of ecosystem services which support the basic natural cycles of water, nutrients and life. Without constant and effective deer management and cohesive land management planning, we would be limited in our ability to deliver some of the above services” (p. 16), definitions (pp. 22, 47), “We are currently reviewing our land management planning and strategic spatial planning systems to take forward the integrated management of woodland and open space using an ecosystem-based approach. This will achieve more joined-up delivery of a full range of ecosystem services, including deer management aspects, and to better take account of uncertainties and pressures like climate change and invasive exotics” (p. 31).</p>	
<p>The Scottish Forestry Strategy: Progress report (2014-15) and future implementation (2015-18) (2015) and related policy documents: The Scottish Forestry Strategy: Description of indicators (Updated 2011), The Scottish Forestry Strategy: Progress indicators published May 2015</p>	<p>Explicit use of the both NC and ES concepts (p. 21): “Continue to secure that the range of ecosystem services and natural capital in forests is recognised and supported”.</p>	<p>Operationalisation in terms of indicators as outlined in complementary documentation: biased in favour of some services (carbon capture, timber production and biodiversity). Data lacking, sometimes no longer collected for others, and weak data-ecosystem functions-ecosystem services linkage (see for instance “Length/area of baseline rivers/lochs in forested catchments where ecological quality is of good or high status”, 2011: 30-31; 2015: 8). The implementation plan builds on other policies and inter-departmental partnerships presented in this table. Pro-active forestry work expanding on ES science mainly evoked in relation to flood risk management, amenity, climate change and to some extent timber supply (species selection). No action targeting air quality, little about soil formation and quality.</p>
<p>Forestry Grant Scheme: M08 - Investments in forest area development and improvement of the viability of forests (art 21-26) and M15 - Forest environmental and climate services and forest conservation (art 34) in the United Kingdom – Rural Development Programme(Regional) - Scotland (2014, last modified 2015: sections 8.2.7, pp. 248-289; 8.2.12, pp. 576-587), Forestry Grant Scheme (SG, online, last retrieved 14/07/2015), Woodlands for water and the Forestry</p>	<p>Measure 08 (pp. 248-250) and 15 (p. 578) in the SRDP explicitly cites ES provision and strengthening as an underpinning rationale. Woodlands for water implicitly builds on ES knowledge: “In the Forestry Grant Scheme (FGS) woodlands for water are those that are located within target areas, and planted and managed in a way that maximises their benefit to both flood management and water quality. Woodlands for water can be on smaller parcels of land, integrating with the business that is already there. Having these well designed and managed woodlands on your land can generate income, complement agricultural activities and make a lasting contribution to local water quality. It does not mean the land stops being productive”.</p>	<p>The detailed scheme provides payments for eight categories of forest creation and management actions: Woodland Creation, Agroforestry, Woodland Improvement Grant, Sustainable Management of Forests, Tree Health, Harvesting and Processing, Forest Infrastructure, and Forestry Co-operation.</p>

Grant Scheme (2015)		
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B: Environment: Air

B.1. Policy documents reviewed

Department for Environment, Food and Rural Affairs (2007) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*. Vol 1. Report, London: The Stationery Office, July.

——— (2007) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*. Vol 2. Report, London: The Stationery Office, July.

——— (2010) *Air Pollution: Action in a Changing Climate*. Report, London: The Stationery Office, March.

——— (2009) *Local Air Quality Management Technical Guidance LAQM.TG(09)*. London: The Stationery Office, February.

Great Britain (1990) *Environmental Protection Act 1990*. Elizabeth II, Chapter 43 (1990). London: The Stationery Office.

——— (1993) *Clean Air Act 1993*. Elizabeth II, Chapter 11 (1993). London: The Stationery Office.

——— (1995) *Environment Act 1995*. Elizabeth II, Chapter 25 (1995). London: The Stationery Office.

——— (1999) *Pollution Prevention and Control Act 1999*. Elizabeth II, Chapter 24 (1999). London: The Stationery Office.

Scotland (2000) *The Air Quality (Scotland) Regulations 2000*. Elizabeth II, 2000 No. 97. London: The Stationery Office.

——— (2010) *The Air Quality Standards (Scotland) Regulations 2010*. Elizabeth II, 2010 No. 204. London: The Stationery Office.

—— (2012) *The Pollution Prevention and Control (Scotland) Regulations 2012*.
Elizabeth II, 2012 No. 360. London: The Stationery Office.

—— (2014) *The Sulphur Content of Liquid Fuels (Scotland) Regulations 2014*.
Elizabeth II, 2014 No. 258. London: The Stationery Office.

Scottish Executive (2002) *The Environmental Protection (Combustion Plants) (Scotland) Directions 2002*. Edinburgh, 4 December.

Scottish Government (2007) *The Pollution Prevention and Control (Combustion Plants) (Scotland) Directions 2007*. Edinburgh, 11 December.

B.2. Content analysis: summary table

Document	Conceptual integration	Operational integration
Environmental Protection Act 1990	No specific integration of ES/NC in relation to the air environment.	Sections 1-28: make provision for the integrated pollution control and air pollution control by local authorities, following Regulations issued by the Secretary of State.
Clean Air Act 1993	No specific integration.	Sections 30-32: pollution control for motor fuel, sulphur and cable burning. Sections 33-40: provisions relative to research and access to information about air pollution.
Environment Act 1995	No specific integration of ES/NC-related concepts.	Sections 80-91: make provisions concerning air quality, with the publication by the Secretary of State of a National Air Quality Strategy (section 80), and the monitoring and management of air quality by local authorities (sections 83-84).
Pollution Prevention and Control Act 1999	No specific integration of ES/NC.	In accordance with Council Directive 96/61/EC on integrated pollution prevention and control , enables the Ministers to establish targets, standards and potentially tradable quotas, prohibit developments, give direction to competent authorities, create offence, publicise information, and enforce charges in relation with pollution prevention. Functions exerted concurrently with the Uk Secretary of State on matters

		relating to energy as provided by the Scotland Act 1998 (Transfer of Functions to the Scottish Ministers etc.) Order 2008.
The Air Quality (Scotland) Regulations 2000 (amended 2002), Local Air Quality Management Technical Guidance LAQM.TG(09) (2009)	No specific integration.	In accordance to the Environment Act 1995, these regulation set air quality targets to be made by local authorities, with monitoring of the following air pollutants: Benzene, 1,3-Butadiene, Carbon monoxide, Lead, Nitrogen dioxide, PM10, and Sulphur dioxide. The 2002 amendment extends the monitoring period and updates the targets. The guidance note provides technical recommendations to this end.
The Environmental Protection (Combustion Plants) (Scotland) Directions 2002; The Pollution Prevention and Control (Combustion Plants) (Scotland) Directions 2007	No reference to ES/NC.	Provisions relative to the Directive 2001/80/EC, giving SEPA specific directions “with respect to the carrying out of its functions under the Pollution Prevention and Control (Scotland) Regulations 2000” regarding large combustions plants.
The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (vol. 1 & 2, 2007)	Implicit and uncomprehensive, focusing on “damage to” and “harmful effects on ecosystems” as well as “ecosystem impacts” (vol. 1: 3, 13-14, 18-19).	Ecosystem protection as a new, explicit aim of the policy with dedicated monitoring, targets and research efforts (vol. 1: 22-25, 49-50; vol. 2: 81, 103-111, 173-184, 189, 196-203, 227-264)
The Air Quality Standards (Scotland) Regulations 2010	No specific integration.	Air quality control and pollution prevention measures against particulate matter, sulphur dioxide, nitrogen dioxide, oxides of nitrogen, particulate matter, lead, benzene, carbon monoxide, arsenic, cadmium, mercury, nickel, benzo(a)pyrene or other polycyclic aromatic hydrocarbons and ozone. Regulations 5-16: set out the procedure to follow to assess ambient air quality. Regulations 17-28: duty of minister regarding control of limit values, public information, and action plan to achieve target values (in Schedules 2-6).
Air Pollution: Action in a Changing Climate (2010)	Explicit but uncomprehensive reference to ecosystem services, as only damage to ecosystem and their function is considered, and this despite the recognition of clean air supply as an	Review document listing the air quality and pollution reduction targets enforced by air policy (pp. 11-19, 23).

	ecosystem service in itself (pp. 8, 15, 17, 22).	
The Pollution Prevention and Control (Scotland) Regulations 2012	No specific integration.	Regulations 5-8, 10, 51-57, 60-66: designation of SEPA as the competent authority for pollution control in accordance with Directive 2010/75/EU, with possibility for Ministers to issue orders. Regulations 11-35, 44-50: provisions relative to permit grant and controlled activities. Regulations 36-43: standard rule setting by SEPA and Scottish Ministers Air pollutants listed in schedule 5 .
The Sulphur Content of Liquid Fuels (Scotland) Regulations 2014	No specific integration.	Limits the sulphur content of fuel to 1% for heavy fuel oil and 0.1% for gas oil, with SEPA as monitoring authority.

B.3. Policy assessment

Conceptual integration: Explicit but incomprehensive in the latest overarching policy documents. The majority of the policy documents relating to clean air maintenance implement pollution prevention and control measures, and thus participate to the pre-ES/NC anthropocentric understanding of the issue. The 2007 Air Quality Strategy marks a first step towards the integration of ES/NC concepts, with explicit references to the damage air pollution inflicts to ecosystems. The complementary 2010 Air Pollution: Action in a Changing Climate report goes further by resorting directly to the notion of ecosystem services and listing air quality regulation as one of them. Yet this publication does not proceed to the next logical stage and fails to mention the ways in which well-functioning ecosystem contribute to clean air supply.

Operational integration: Moving towards explicit but not comprehensive. The latest Air Quality Strategy in date shows once again the first signs of ES/NC integration in a context dominated by a reductive vision of air quality maintenance dominated by pollution reduction. The two volumes of the Strategy introduce ecosystem and vegetation health indicators as monitoring and objective-setting variables. However this approach remain incomprehensive to the extent that it illustrate a merely passive integration of ES/NC knowledge up to the research directions presented in the documents, which do not even identify contribution of ecosystems to air quality as a topic requiring further study. The absence of Scottish regulations displaying the level of ES/NC understanding that can be found in the Strategy since its publication should also be noted, the way those are framed still corresponding to a focus on pollution control.

C: Environment - Soil

C.1. Policy documents reviewed

Dobbie KE, Bruneau PMC and Towers W. (eds) (2011) *The State of Scotland's Soil*. Report for the Scottish Government, Edinburgh, 22 March.

Great Britain (1990) *Environmental Protection Act 1990: Part IIA*. Elizabeth II, Chapter 43 (1990). London: The Stationery Office.

Halcrow Group Limited (2010) *Scottish Soil Framework: Post-Adoption SEA Statement*. Report for the Scottish Government, London, November.

Scotland (2000) *The Contaminated Land (Scotland) Regulations 2000*. Elizabeth II, 2000 No. 178. London: The Stationery Office.

——— (2005) *The Contaminated Land (Scotland) Regulations 2005*. Elizabeth II, 2005 No. 658. London: The Stationery Office.

Scottish Environment Protection Agency, National Waste Policy Unit (2010) *SEPA Regulatory Position Statement – Developments on Peat*. Stirling, 9 February.

Scottish Executive (2006a) *Contaminated Land Statutory Guidance: Edition 2*, Paper SE/2006/44. Edinburgh, May.

Scottish Government (2009b) *The Scottish Soil Framework*. Edinburgh, May.

Scottish Renewables and Scottish Environment Protection Agency (2012) *Scottish Developments on peatlands: Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste*. Report, January.

Scottish Natural Heritage. 2014a. *Scotland's National Peatland Plan: working for our future: A consultation paper*. Inverness.

C.2. Content analysis: summary table

Document	Conceptual integration	Operational integration
<p>Contaminated land policy: Environmental Protection Act 1990: Part IIA; The Contaminated Land (Scotland) Regulations 2000; The Contaminated Land (Scotland) Regulations 2005; Contaminated Land Statutory Guidance: Edition 2 (2006)</p>	<p>No explicit integration although the policy implicitly build on the need to preserve soil ecosystem services, with an emphasis on water supply. The only reference to ecosystems that also implicitly mentions their services actually comes from the connection between this scheme with water environment policy: “Section 78A(9) defines pollution of the water environment in terms of the direct or indirect introduction into the water environment of substances which may give rise to harm to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems, result in damage to material property or impair or interfere with amenities and other legitimate uses of the water environment” (Statutory Guidance, p. 84).</p>	<p>Part IIA of the Environmental Protection Act 1990 makes provision for the designation of contaminated land and specific sites requiring remediation by local authorities through the issuing of remediation notices by SEPA. “Remediation” mean [...] the doing of anything for the purpose of assessing the condition of (i)the contaminated land in question; (ii)any controlled waters affected by that land; or (iii)any land adjoining or adjacent to that land; (b)the doing of any works, the carrying out of any operations or the taking of any steps in relation to any such land or waters for the purpose (i)of preventing or minimising, or remedying or mitigating the effects of, any significant harm, or any pollution of controlled waters, by reason of which the contaminated land is such land; or (ii)of restoring the land or waters to their former state” (section 78A(7)).</p> <p>The 2000 Regulations detail some aspects of the scheme. The 2005 Regulations strengthen the ties between this scheme and water policy. The Statutory Guidance provides practical recommendation for the implementation of the framework, especially concerning remediation (pp. 106-111).</p>
<p>The Scottish Soil Framework (2009); Scottish Soil Framework: Post-Adoption SEA Statement (2010)</p>	<p>Sections 2.9-2.13: present “soil functions” and the benefits humans derive from them Section 2.14: describe ecosystem services as an alternative, “further concept which can be used to frame how soils provide environmental,</p>	<p>Chapter 6 (pp. 36-38) outlines the existing instruments contributing to “sustainable soil management”. Chapter 7 lists 13 soil outcomes to be achieved</p>

	economic and societal benefits". The SEA shows the role of SEPA in SNH in adopting the ES/NC framework.	through coordinated policy action steered by an inter-departmental Soil Focus Group. Key Research Outputs including mapping, monitoring and guidance are also designated (pp. 38-50).
The State of Scotland's Soil (2011)	The notion of ecosystem functions and services is used repeatedly in the entire text, with comprehensive accounts of how they contribute to human wellbeing.	Informative report identifying the following needs: policy integration, additional data, development of appropriate development practices (pp. 124-134).
Developments on peatlands: Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (2012); SEPA Regulatory Position Statement – Developments on Peat (2010)	Implicitly based on the services delivered by peatland, mainly its carbon storage capacity that can offset the net GHG balance of renewable energy developments if degraded.	Guidance for the minimisation of ES loss when developments are conducted on peatland. Links to several technical notes from the Scottish Government, SEPA, SNH and other stakeholders.
Scotland's National Peatland Plan: working for our future: A consultation paper (2014)	Explicit and comprehensive account of the natural capital value of peatland and the ecosystem services associated with them (with a tendency to prefer the phrase ecosystem benefits and an emphasis on carbon storage): "We are coming to realise the great significance and importance of these areas. As stores of carbon they are supremely important in helping to tackle climate warming; as homes for nature they are special and unique; and as the raw ingredient of rural farming, tourism and crofting they are vital. Many other benefits flow from them, especially where they are in good health - clean water, lower flood risk, beautiful landscapes, and other defining characteristics of wild Scotland. Some of the uses are distinctively Scottish – the contributions of peat to the whisky industry and as a domestic fuel in rural parts, to name just two" (p. 2) "SNH's Climate Change Action Plan reinforces this and highlights the importance of peatlands for carbon sequestration, and opportunities for making them more resilient to climate change. In the face of climate change we have to improve management measures to make peatlands more resilient", "Peat bogs	Peatland Action (pp. 16-29): publication of a Peatland Code, funds for protection, restoration and enhancement (various sources: SNH, SRDP, Heritage Lottery Fund, Landscape Partnership Fund, EU LIFE programme, Peatland Code and private Sponsorship, Scottish Water Sustainable Land Management Incentive Scheme), control of planning developments, partnerships with land managers.

	provide many benefits: Nature; Water supply; Flood management; Historic environment; International image; Fuel; Sheep grazing; Sporting management; Recreation ” (pp. 12-15), “heavy emphasis on the natural capital value of peatlands, and the importance of adopting the ecosystem approach” (p. 20).	
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C.3. Policy assessment

Note that general pollution prevention and control legislation reviewed in the air policy section apply to soil. It has not been included here since sectoral frameworks refer to them and promote measures showing higher levels of ES/NC integration.

Conceptual integration: Explicit and comprehensive – in framework documents. Ecosystem services are directly mentioned in the Scottish Soil Framework, where a box is devoted to the presentation of the concept (SG, 2009a: 19). Interestingly this section has been added following recommendations from SNH and SEPA (Halcrow Group Limited, 2010: 25, 65), which also explains why in the rest of the document the different – yet related – phrase “soil function/benefit” seems to be preferred. This alternative term is used to list the benefits society derives from soil ecosystems (SG, 2009a: 16-19). ‘Sub-sectoral’ documents, such as those relative to developments of peatlands, emphasise particular ecosystem services, often in conservation terms – carbon sequestration in the case of peat.

Operational integration: Implicit and incomprehensive for the moment, might evolve with the implementation of dedicated peatland policy. The way in which soil policy is articulated somewhat limits the operational integration of ES/NC. Even though the Framework proposes a new action plan, this policy builds on and refers to laws and regulations that prove very uneven in the use they make of these concepts. A significant share of these texts consists for instance in pollution prevention, control or remediation measures, which are “generally limited to the protection of a specific impact or function of that soil” (SG, 2009a: 37). Peatland policy has so far also been limited to the minimisation of negative impacts, but the development of a National Peatland Plan after consultation in 2014 is set to articulate a proactive vision including habitat enhancement for ES maximisation.

D: Environment - Water

D.1. Policy documents reviewed

Environment Agency and Scottish Government (2009) *The river basin management plan for the Solway Tweed river basin district 2009–2015*. Report.

Great Britain (2004) *The Water Environment (Water Framework Directive) (Solway Tweed River Basin District) Regulations 2004*. Elizabeth II, 2004 No. 99. London: The Stationery Office.

Scotland (2002) *Water Industry (Scotland) Act 2002*. Elizabeth II, Asp 3 (2002). London: The Stationery Office.

——— (2003) *Water Environment and Water Services (Scotland) Act 2003*. Elizabeth II, Asp 3 (2003). London: The Stationery Office.

——— (2005) *Water Services etc. (Scotland) Act 2005*. Elizabeth II, Asp 3 (2005). London: The Stationery Office.

——— (2008) *The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008*. Elizabeth II, 2008 No. 98. London: The Stationery Office.

——— (2009) *Flood Risk Management (Scotland) Act 2009*. Elizabeth II, Asp 6 (2009). London: The Stationery Office.

——— (2011) *The Water Environment (Controlled Activities) (Scotland) Regulations 2011*. Elizabeth II, 2011 No. 209. London: The Stationery Office.

——— (2013) *Water Resources (Scotland) Act 2013*. Elizabeth II, Asp 5 (2013). London: The Stationery Office.

——— (2013) *The Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013*. Elizabeth II, 2013 No. 323. London: The Stationery Office.

Scottish Environment Protection Agency (2009) The river basin management plan for the Scotland river basin district 2009–2015: Strategic Environmental Assessment statement. Stirling, 22 December.

——— (2009) The river basin management plan for the Scotland river basin district 2009–2015. Prepared for the Scottish Government, Edinburgh.

——— (2013) Improving the physical condition of Scotland’s water environment: A supplementary plan for the river basin management plans. Prepared for the Scottish Government, Edinburgh, August.

——— (2015) Water Environment (Controlled Activities) Fees and Charges (Scotland) Scheme 2015. Stirling, 31 March.

——— (2015b) The river basin management plan for the Scotland river basin district: 2015–2027: Working together to protect and improve our water environment. Prepared for the Scottish Government, Edinburgh, 21 December.

Scottish Executive (2007a) Implementing the Water Environment and Water Services (Scotland) Act 2003: Principles for Setting Objectives for the River Basin Management Plan. Edinburgh, March.

Scottish Government (2014b) *The Scotland River Basin District (Standards) Directions 2014*. Edinburgh, 19 August.

——— (2014c) *The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014*. Edinburgh, 19 August.

——— (2014d) *The Scotland River Basin District (Status) Directions 2014*. Edinburgh, 19 August.

——— (2014e) *The Solway Tweed River Basin District (Status) (Scotland) Directions 2014*. Edinburgh, 19 August.

—— (2014f) *The Scottish Water (Objectives: 2015 to 2021) Directions 2014*.

Edinburgh, 1 October.

D.2. Content analysis: summary table

Document	Conceptual integration	Operational integration
<p>Water Industry (Scotland) Act 2002</p>	<p>Section 53: mentions “the conservation and enhancement of natural beauty and the conservation of flora and fauna”</p>	<p>Sections 51, 53-54: Statutory duties of Scottish Water relative to the environment and sustainability.</p>
<p>Water Environment and Water Services (Scotland) Act 2003 *Provisions repeated in the The Water Environment (Water Framework Directive) (Solway Tweed River Basin District) Regulations 2004</p>	<p>Even though this Act does not mention NC/ES explicitly, its very title hints at these notion by combining the water environment and the services it provides. Section 1: This document also provides a comprehensive definition of environmental protection implicitly based on an ecosystem approach. Subsection 2 and 3 goes as follows: “In this Part “protection of the water environment” includes, in particular— (a) preventing further deterioration of, and protecting and enhancing, the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on those aquatic ecosystems, (b) promoting sustainable water use based on the long-term protection of available water resources, (c) aiming at enhancing protection and improvement of the aquatic environment through, amongst other things, specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing out of discharges, emissions and losses of the priority hazardous substances, (d) ensuring the progressive reduction of pollution of groundwater and preventing further pollution of it, and (e) contributing to mitigating the effects of floods and droughts, with a view to contributing to the achievement of the aims specified in subsection (3). (3) Those aims are— (a) the provision of a sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use, (b) a significant reduction in pollution of groundwater.”</p> <p>* The Solway Tweed river basin</p>	<p>Section 3: the SG must map inland, coastal and marine waters. Sections 4-17: RBMPs Scottish Ministers must delimit river basin districts and identification by Ministers of “bodies of water used for the abstraction of drinking water” (4, 6). SEPA must carry out a “characterisation” of river basin districts (including an analysis of the characteristics of the water environment, a review of the impact of human activity, and an economic analysis of water use) 6 years “in accordance with the technical specifications set out in Annexes II and III to the WFD”, completed by criteria selected by Ministers (5, 17). Protected areas have be registered and monitored by SEPA (7, 8). Environmental objectives and RBMPs are to be developed and reviewed by SEPA, and then approved by Ministers. Consultation and the constitution of advisory groups by SEPA are required (9-15). Documents must be accessible to the public (16). Sections 20-21, 23: Regulation of controlled</p>

	Regulations also mention “ecological status” defined as “an expression of the quality of the structure and functioning of aquatic ecosystems associated with surface waters”.	activities The SG must issue regulations concerning activities potentially harmful to ecosystems and approve fish farming planning applications after consulting SEPA and the other relevant authorities. Section 22: the pricing of water services can be used by government to protect the environment.
Water Services etc. (Scotland) Act 2005	NSI	Section 30: prevention of water pollution caused by coal mining, emphasis on protection and mitigation.
Implementing the Water Environment and Water Services (Scotland) Act 2003: Principles for Setting Objectives for the River Basin Management Plan (2007)	Implicit reference to “improving the water environment” with no explicit mention of the benefits of reaching “good ecological status” beyond avoiding the detrimental effects of environmental degradation (5-6, 16-17). “Objective setting” is in this document limited to achieving better water quality designations (20-21).	
The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008	No specific integration.	Nitrate pollution prevention measures and related threshold/ calculations.
Flood Risk Management (Scotland) Act 2009	Preamble, sections 1, 3: “sustainable management of flood risk”, definition of damage integrating “adverse consequences” to the environment, society and/or the economy. Sections 20, 28: recognition of the role played by “natural features”.	Sections 17-20: SEPA and local authorities have the duty to map and assess bodies of water and natural features contributing to flood risk and prevention Sections 21-33: SEPA’s duties regarding the submission to Ministers of flood risk maps and flood management plans for approval. “SEPA must consider measures that seek to reduce, slow or otherwise manage flood water by altering (including enhancing) or restoring natural features and characteristics” (20, 28). The SG is to issue guidance about such measures (29).

		<p>Sections 34-39: similar responsibilities from local authorities with regards to local flood risk management plans.</p> <p>Sections 49-50: requirement of establishing advisory groups at both levels.</p> <p>*SEPA also co-ordinates pilot catchment projects using habitat restoration to reduce flood risk (SEPA, online).</p>
<p>The RBMP for the Scotland river basin district 2009–2015, and supporting SEA (2009)</p> <p>*No mention of NC/ES in the Solway Tweed RBMP</p>	<p>The plan takes ecosystem services into account as both means to achieve objectives and desired outcomes. However ecosystem services are not defined in the framework presented and seem to have been significantly limited in scope – carbon sequestration and drought/flood prevention are for instance not included.</p>	<p>The plan recapitulates the existing legislative framework. It also points at available funding for voluntary enhancement and restoration projects and highlights SEPA's priorities in developing education and advice resources (SEPA, 2009c: 11-12). The Agency manages a dedicated Water Environment Fund to support specific projects (SEPA, online).</p> <p>The proposed measures mainly promote a passive approach to ecosystem services. The solutions to water quality and flood risk issues outlined in the plan only consider them as endogenous variables to be preserved, and not as supporting mechanisms (18-19, 22-23, 27-28, 32, 35, 39, 42, 44). Integrated responses recognising the role of ES towards the achievement of the plan are only invoked in the case of objectives directly related to biological processes such as fisheries management (50, 52-53, 55).</p>
<p>The Water Environment (Controlled Activities) (Scotland) Regulations 2011,</p>	<p>NSI, but builds on the Water Environment and Water Services (Scotland) Act 2003 (see preamble)</p>	<p>Regulation 5: duty for operators to use water efficiently.</p> <p>Regulations 6-35: Authorisation of controlled activities</p>

<p>complemented by the Water Environment (Controlled Activities) Fees and Charges (Scotland) Scheme 2015</p>		<p>Activities that are potentially harmful to the environment are subject to general binding rules (regulation 6, Schedule 3). SEPA is responsible for their monitoring and enforcement through the issuing of authorisations and the taking of court proceedings. SEPA can undertake mitigation works and provide compensation to adversely-affected stakeholders, a provision that echoes the challenge of balancing the multiple interests surrounding freshwater ecosystem services.</p> <p>Schedule 5 and complementary scheme: Charging scheme SEPA uses application fees and subsistence charges to create economic incentives. Mitigation and improvement works are eligible for discounts, while large-scale and risky activities are charged more.</p>
<p>Water Resources (Scotland) Act 2013</p>	<p>Sections 1-3: Duties of Scottish Ministers Implicit references to NC/ES. The opening section generates obligations regarding “the development of the value of Scotland’s water resources” and their “sustainable use of the resources”. Section 3 goes as follows: “the value of water resources— (a) means the value of the resources on any basis (including their monetary or nonmonetary worth), (b) extends to the economic, social, environmental or other benefit deriving from the use of the resources (or any activities in relation to them). “</p>	<p>Sections 10, 13: Ministers must seek the advice of SEPA to authorise water abstraction. Sections 21, 34, 38H, 50: refers to the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (S.S.I. 2011/209) Section 76M: no reference to ecosystems services in raw water quality (see section 6(1) of the Water Environment and Water Services (Scotland) Act 2003) Schedule 1, section 4: Ministers must seek SEPA’s advice to issue orders in the case of draught</p>
<p>Improving the</p>	<p>Explicit reference to ecosystem services,</p>	

<p>physical condition of Scotland’s water environment (2013)</p>	<p>driven by the land use strategy and with a declaration of intent to integrate it to marine and climate change strategies in an effort towards “policy alignment” (4, 33-35, 42).</p>	
<p>The Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013</p>	<p>NSI, but implicit elements relative to the improvement of water bodies and the necessity to achieve desirable trade-offs between the different benefits they provide (regulations 6-9).</p>	<p>Enacts and details the provisions presented in the Water Environment and Water Services (Scotland) Act 2003. Regulations 6-9: the recognition of the need to balance objectives provides a legal basis for new management principles.</p>
<p>The Scotland River Basin District (Standards) Directions 2014 and The Solway Tweed River Basin District (Standards) (Scotland) Directions 2014</p>	<p>No explicit reference to ecosystem <i>services</i>, but both sets of direction mention the “structure and functioning of the aquatic ecosystem[s] concerned” (Schedule 2).</p>	<p>Directions 2 to 5: Standards to assess the quality of water bodies are based on biological, hydro-morphological, chemical, physiochemical and spatial data.</p>
<p>The Scotland River Basin District (Status) Directions 2014 and The Solway Tweed River Basin District (Status) (Scotland) Directions 2014</p>	<p>No explicit reference to ecosystem services but requirement to assess the “ecological potential” of artificial water bodies (Schedule 2).</p>	<p>These Directions set out more monitoring measures to be undertaken by SEPA.</p>
<p>The Scottish Water (Objectives: 2015 to 2021) Directions 2014</p>	<p>NSI</p>	<p>Directions 6, 7: duties to ‘contribute to improvements to Scotland’s natural and built environment and the sustainable use and enjoyment of it’, including ‘natural features’. These dispositions focus on conservation.</p>
<p>The river basin management plan for the Scotland river basin district: 2015–2027: Working together to protect and improve our water</p>	<p>No explicit use, but a rather broad range of “benefits” identified in introduction (p. 4): “Working together to secure the sustainable use of the water environment will help maximise the benefits a healthy water environment can bring for people and businesses. It will also help identify, and make use of, opportunities to contribute to</p>	<p>In practice the management plan focuses on benefits to “people and business”, linking water quality (and therefore a mostly conservation-based approach) to health, recreation and the</p>

environment (2015)	our wider goals, including those for improved resilience to climate change, biodiversity, forestry, flood risk management, fisheries and sustainable land use.”	provision of edible goods. Hints towards the “wider goals” mentioned earlier in the document do not clearly translate into concrete measures.
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D.3. Policy assessment

Note that general pollution prevention and control legislation reviewed in the air and soil policy section apply to the water environment. It has not been included here since sectoral frameworks refer to them and promote measures showing higher levels of ES/NC integration.

Conceptual integration: Mostly implicit despite some progress in legislation, explicit but still incomprehensive in plans and strategies. The bulk of the policy review was conducted over summer 2015, and at the time it looked like the new RBMP would enact the full-fledged adoption of the ES/NC framework, yet its publication in December of that year showed no further sign of explicit integration. Acts of the Scottish Parliament abundantly refer to the European Water Framework and Floods Directives but fail to explicitly mention ES/NC, just like the European source they quote. The influence of the EU’s policy framework is palpable in the sense that the Water Environment and Water Services (Scotland) Act 2003, which directly transposed the WFD, was until recently the closest to explicit piece of legislation on the matter. This Act refers to aquatic ecosystems as constituting the “water environment” and directly links them to the provision of water services. The Water Resources (Scotland) Act 2013 marks another step forward as it recognises “nonmonetary worth” as contributing to the value of water resources. The notion of ecosystem services is explicitly used in several plans and strategies, yet it suffers from being defined quite restrictively, as in the 2009 RBMPs for instance. Scottish water quality and flood risk management strategies reflect European Directives and pay little attention to the influence of aquatic ecosystems on these issues (Kettunen et al., loc. cit.). However newer governmental guidance such as ‘Improving the physical condition of Scotland’s water environment’ shows sign of a more comprehensive, integrated vision in line with the SG’s promotion of the ecosystem approach.

Operational integration: Explicit in some documents but incomprehensive. Despite manifest attempts to integrate ES/NC in RBMPs’ objectives, conceptual limitations find echoes in the operationalisation of ES/NC proposed by Scottish water environmental policy. Since the impact of ecological processes on water flow, quality and retention is not fully understood and recognised, policy instruments are mainly designed to address environmental inputs and outputs. Another obstacle reflecting European policy concerns monitoring indicators, which tend to give too much importance to “biological structures” at the expense of their translation into functions and services¹ (see both river basins’ 2014 Standards Directions). As a result proposed alteration works put a stronger emphasis on damage reduction and compensation than on ES optimisation. Yet once

¹ Hering D, Borja A, et al. (2010) The European Water Framework Directive at the Age of 10: A Critical Review of the Achievements with Recommendations for the Future. *Science of The Total Environment*, 408 (19): 4010-4011.

again promising developments are currently unfolding, like the renewed criteria for objective-setting outlined in The Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013.

E: Agriculture, rural development and land use

E.1. Policy documents reviewed

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——— (2014) Protecting Plant Health: A Plant Biosecurity Strategy for Great Britain. London: The Stationery Office, April.

Joint Nature Conservation Committee (2012) Format for a Prioritised Action Framework (PAF) for Natura 2000 – For the EU Multiannual Financing Period 2014-2020: United Kingdom and Gibraltar sections A-B. Peterborough, 11 May.

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- Scotland (2000) *National Parks (Scotland) Act 2000*. Elizabeth II, Asp 10 (2000). London: The Stationery Office.
- (2003) *Land Reform (Scotland) Act 2003*. Elizabeth II, Asp 2 (2003). London: The Stationery Office.
- (2004) *Nature Conservation (Scotland) Act 2004*. Elizabeth II, Asp 6 (2004). London: The Stationery Office.
- (2004) *The Conservation (Natural Habitats, etc.) Amendment (Scotland) Regulations 2004*. Elizabeth II, 2004 No. 275. London: The Stationery Office.
- (2006) *Planning etc. (Scotland) Act 2006*. Elizabeth II, Asp 17 (2006). London: The Stationery Office.
- (2006) *The Crofting Counties Agricultural Grants (Scotland) Scheme 2006*. Elizabeth II, 2006 No. 24. London: The Stationery Office.
- (2006) *The Environmental Impact Assessment (Agriculture) (Scotland) Regulations 2006*. Elizabeth II, 2006 No. 582. London: The Stationery Office.
- (2008) *The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008*. Elizabeth II, 2008 No. 298. London: The Stationery Office.
- (2010) *The Welfare of Farmed Animals (Scotland) Regulations 2010*. Elizabeth II, 2010 No. 388. London: The Stationery Office.
- (2010) *The Less Favoured Area Support Scheme (Scotland) Regulations 2010*. Elizabeth II, 2010 No. 273. London: The Stationery Office.
- (2011) *Wildlife and Natural Environment (Scotland) Act 2011*. Elizabeth II, Asp 6 (2011). London: The Stationery Office.

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——— (2015) *The Common Agricultural Policy (Direct Payments etc.) (Scotland) Regulations 2015*. Elizabeth II, 2015 No. 58. London: The Stationery Office.

——— (2015) *The Rural Development (Scotland) Regulations 2015*. Elizabeth II, 2015 No. 192. London: The Stationery Office.

——— (2015) *The Crofting Counties Agricultural Grants (Scotland) Variation Scheme 2015*. Elizabeth II, 2015 No. 105. London: The Stationery Office.

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——— (2005) Prevention of Environmental Pollution from Agricultural Activity: A Code of Good Practice. Edinburgh, January.

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- (2010c) Land Use Strategy Strategic Environmental Assessment Screening and Scoping Report. Edinburgh, March.
- (2011a) Getting the best from our land: A land use strategy for Scotland. Edinburgh, March.
- (2011b) Applying an ecosystems approach to land use: Information Note. Edinburgh, March.
- (2011c) Our Rural Future: The Scottish Government's response to the Speak Up for Rural Scotland consultation. Edinburgh, March.
- (2011d) Getting the best from our land: A land use strategy for Scotland – Action Plan 2011. Edinburgh, December.
- (2012b) Making the most of communities' natural assets: green infrastructure – An information note for Community Planning Partnerships on applying an ecosystems approach. Edinburgh, 10 September.
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- (2014i) Ambition, Opportunity, Place: Scotland's Third National Planning Framework. Edinburgh, June.
- (2014j) The new Common Agricultural Policy in Scotland: An introduction to what it means for you. Edinburgh, June.
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——— (2005) Scottish Outdoor Access Code. Inverness, February.

——— (2008) Scotland's Wild Deer: A National Approach. Inverness, November.

——— (2011) Code of Practice on Deer Management. Inverness, December.

——— (2012a) SNH Information Note: Green Networks in Development Planning. Inverness, 1 March.

——— (2013a) Scotland's Wild Deer: A National Approach – Action Plan 2013-2016 & Report 2012/13. Report, Inverness.

——— (2013b) SNH Core Areas of Wild Land 2013 Map: Consultation Paper. Inverness.

——— (2014b) Scotland's Wild Deer: A National Approach, 2014 Review Including 2015 – 2020 Priorities. Inverness.

——— (2014c) SNH Core Areas of Wild Land 2013 Map: Analysis of Consultation Responses. Inverness, February.

——— (2014d) Core Areas of Wild Land 2013 Map: Scottish Natural Heritage's Advice to Government – 16th June 2014. Inverness, 16 June.

Smith J (1978) Scotland's Scenic Heritage. Report for the Countryside Commission for Scotland, Edinburgh: Scottish Office.

E.2. Content analysis: summary table

Document	Conceptual integration	Operational integration
<p>Scotland’s Scenic Heritage (1978)</p>	<p>Predates the elaboration of the NC/ES concepts, yet some phrases and themes prefigure the current framing of the issue in Scotland: “It is the nation’s responsibility to watch over and cherish this asset and to pass it on to future generations in a way which will show that proper care and concern have been taken to accommodate necessary new developments and to retain the natural attractiveness and amenity which the community has inherited from its predecessors” (p. 2). “[...] conservation and enhancement of the natural beauty and amenity of the countryside” (p. 12).</p>	<p>Designation of National Scenic Areas (unchanged since).</p>
<p>Town and Country Planning (Scotland) Act 1997 (amended with regards to environmental impacts 1999)</p>	<p>Same as above: “conservation of the natural beauty and amenity of the land” (section 7, 11).</p>	<p>Section 11: preparation of local plans with provisions to the “conservation of the natural beauty and amenity of the land”. Section 40: possibility to make provision for developments presenting “likely environmental effects”. Section 190: the Secretary of State for the Environment can acquire land compulsorily.</p>
<p>National Parks (Scotland) Act 2000</p> <p>* From which the Loch Lomond and The Trossachs as well as the Cairngorms National Park Designation, Transitional and Consequential Provisions (Scotland) Order 2003, as well as subsequent amendment and modifications, are derived.</p>	<p>No explicit mention of NC/ES but proactive management approach and focus on the cultural/recreational value of “natural heritage”. Section 1: “In this Act, references to the National Park aims are to the following aims in relation to an area— (a) to conserve and enhance the natural and cultural heritage of the area, (b) to promote sustainable use of the natural resources of the area, (c) to promote understanding and enjoyment (including enjoyment in the form of recreation) of the special qualities of the area by the public, and (d) to promote sustainable economic and social development of the area’s Communities”. Section 35, “Interpretation”: ““natural heritage” includes the flora and fauna of a National Park [...] its geological and physiographical features and its natural beauty and amenity”.</p>	<p>Section 1: outline of the aims of National Parks. Section 2-8, Schedule 1: proposal, designation and creation of National Parks with <i>ad hoc</i> Authorities. Section 9-26, Schedules 2-3: functions, powers and duties of National Park Authorities, including planning, management agreements, finances, report and monitoring, joint operations with other public bodies, bylaws, research, access charges.</p>
<p>SNH Wildland policy: Policy</p>	<p>The first 3 SNH own publications seldom refer to the NC/ES concepts</p>	<p>These publications accompany an ongoing policy</p>

<p>Statement: Wildness in Scotland's countryside (2002), Commissioned Report No. 194: A review of the benefits and opportunities attributed to Scotland's landscapes of wild character (2006), SNH Core Areas of Wild Land 2013 Map: Consultation Paper (2013), SNH Core Areas of Wild Land 2013 Map: Analysis of Consultation Responses (2014), Core Areas of Wild Land 2013 Map: Scottish Natural Heritage's Advice to Government – 16th June 2014</p>	<p>and rather emphasise nature's intrinsic value, with vague mention to "enhancing nature" (2002: 8). Yet the consultation exercise has led to the development of a narrative around some of the benefits associated with wild land: "Wildness is a key quality of Scotland's landscapes which is widely appreciated and increasingly recognised as a high-value asset. Scotland's extensive natural and seminatural areas - often rugged, relatively remote and showing limited obvious management or development - are an important part of the nation's identity that sets it apart from the rest of the UK. These areas provide significant economic benefits, especially by attracting visitors to Scotland, and are often promoted in the marketing of products and services. Significant health and social benefits accrue from their use as many people derive both physical and mental benefit from recreating in these areas. The habitats found within them are also an important resource for biodiversity and carbon management" (2013: 2), "Wild land was seen as a significant asset which offers a range of benefits, and is integral to the character or identity of Scotland and its regions. This included reference to benefits in terms of health and wellbeing (primarily in relation to leisure/recreation activities), economic development (at a local and national level), supporting local ecology and biodiversity, and achieving carbon reduction targets" (2014: 4). The 2002 statement also highlight competition between services without phrasing it this way (pp. 6-8). The commissioned report explicitly uses the concept of ecosystem services, yet it limits its definition to non-monetarily-valuable regulating and supporting services (pp. 36-38, 4-46, 73-75). SNH Advice to the SG is more in line with the ecosystem approach now promoted in planning policy, explicitly mentioning ecosystem services (pp. 3, 13) and detailing to which of them areas of wild land contribute: "Scotland's wild land areas are also not redundant and unused, but subject to</p>	<p>development led by SNH. The designation/mapping and proposed regulation of activities in so-called "Core Areas of Wild Land" (CAWLs) has been commissioned by the Scottish Government in prevision of the upcoming review of the National Planning framework.</p>
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	<p>some land management and activity that provides a range of social, economic and environmental benefits. These include providing opportunities for recreation, hunting and fishing, attracting visitors to areas and sustaining tourism, supporting some of Scotland's most important and iconic wildlife, acting as a carbon store and carbon capture, and playing a key role in the hydrological cycle. This range of ecosystem services supported by Scotland's wild land resource was recognised by many responses to the consultation" (p. 7, emphasis in original).</p>	
<p>Land Reform (Scotland) Act 2003</p> <p>*Principles driving the Scottish Outdoor Access Code (2005).</p>	<p>No explicit reference to NC/ES or related notions apart from the following definition: "natural heritage" includes the flora and fauna of land, its geological and physiographical features and its natural beauty and amenity" (section 32).</p>	<p>Sections 1-31: provisions regarding access rights to the countryside, including the publication of an Outdoors Access Code by SNH (section 10). Bot local authorities and SNH can limit access rights for the "the conservation or enhancement of natural or cultural heritage" (sections 10-11, 29).</p> <p>Sections 33-97A: provisions establishing a community right to buy land.</p>
<p>Scottish Natura 2000 policy: Nature Conservation (Scotland) Act 2004 and The Conservation (Natural Habitats, etc.) Amendment (Scotland) Regulations 2004, amending The Conservation (Natural Habitats, etc.) Regulations 1994, Format for a Prioritised Action Framework (PAF) for Natura 2000 – For the EU Multiannual Financing Period 2014-2020: United Kingdom and Gibraltar sections A-B (2012), Format</p>	<p>No specific integration of the NC/ES concepts in the 2004 Act and regulations Amendment (reference to the "enhancement of natural features" in the Act, but no detail regarding potential proactive measures). Yet some provisions of the 1994 Regulations reveal an early understanding of underlying notions (see the operationalisation column).</p> <p>The Scottish Natura 2000 PAF is linked with the Climate Change Adaptation programme and its objectives, and as such explicitly uses the notion of ecosystem services (pp. 8-9).</p>	<p>1994 Regulations: Regulations 7-15: Designation of Natura 2000 sites (Special Areas of Conservation and Special Protection Areas – SACs and SPAs).</p> <p>Regulations 16-32, Schedule 1: Provisions relative to the management of SACs and SPAs, including management agreement with landowners, control of activities, issuing of "special nature conservation orders, bylaws and compulsory purchase of land.</p> <p>Regulations 33-36: special provisions regarding marine sites.</p> <p>Regulations 38-46, Schedules 2-4: provision ensuring the protection of certain species.</p> <p>Regulations 47-108: integration/alignment of existing policies, especially</p>

<p>for a Prioritised Action Framework (PAF) for Natura 2000 – For the EU Multiannual Financing Period 2014-2020: Scotland (2012)</p>		<p>planning rules.</p> <p>Regulation 24 considers potential trade-offs as “imperative reasons of overriding public interest”: “(5) If on the matter being referred to the Secretary of State he is satisfied that, there being no alternative solutions, the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to paragraph (6), may be of a social or economic nature), he may direct the appropriate nature conservation body to give consent to the operation. (6) Where the site concerned hosts a priority natural habitat type or a priority species, the reasons referred to in paragraph (5) must be either– (a) reasons relating to human health, public safety or beneficial consequences of primary importance to the environment, or (b) other reasons which in the opinion of the European Commission are imperative reasons of overriding public interest”.</p> <p>Regulation 37 hints towards proactive environmental management based on ecological dynamics: “For the purposes of the planning enactments mentioned below [Town and Planning Acts], policies in respect of the conservation of the natural beauty and amenity of the land shall be taken to include policies encouraging the management of features of the landscape which are of major importance for wild flora and fauna. Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems of marking field boundaries) or their function as stepping stones</p>
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		<p>(such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species”.</p> <p>2004 Act:</p> <p>Sections 1-2: duty of Scottish authorities and public bodies to promote biodiversity, publication of a strategy to this end.</p> <p>Sections 3-22: designations of Sites of Specific Scientific Interest (SSSIs), in which some activities are subject to SNH’s consent. The agency can also make bylaws (guided by an advisory committee).</p> <p>Sections 23-37: possibility for Ministers to issue nature conservation and land management orders.</p> <p>Section 38: designation of protected “Ramsar” wetland sites.</p> <p>Sections 39, 41, 45: additional powers to SNH (land acquisition, signage, enforcement).</p> <p>Section 40: court-issued restoration orders.</p> <p>Sections 43-44: entry and investigation powers to the police and authorised inspectors.</p> <p>2004 Regulations: update of the 1994 Regulations with regard to the transfer of duties to the Scottish Executive. Extent of the relevant authorities’ intervention powers with nature conservation/land management/restoration orders, police investigation and entry authorisation for wildlife inspectors.</p> <p>UK and Gibraltar PAF: list and designation of the UK SACs and SPAs</p> <p>Scottish PAF: alignment of the PAF with other policies (land use, marine environment protection, biodiversity, land use, <i>etc.</i>).</p>
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Animal welfare policy: Animal Health and Welfare Strategy for Great Britain (2004), The Welfare of Farmed Animals (Scotland) Regulations 2010, Animal Health & Welfare Framework 2014-2015	No specific integration despite several mentions to the “environmental needs” of animals.	No relevant instruments.
Prevention of Environmental Pollution from Agricultural Activity: A Code of Good Practice (2005), Pesticides: Code of practice for using plant protection products in Scotland (2006), The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008	No specific integration. “Improvement” of the environment mentioned repeatedly actually describing improvement of environmental conditions through protection, and not a proactive approach.	Focus on pollution prevention, as outlined by the Good Agricultural and Environmental Condition (GAEC, see below the Agricultural Policy (Cross-Compliance) (Scotland) Regulations 2014)
The Crofting Counties Agricultural Grants (Scotland) Scheme 2006	No specific integration.	Part 2, “Grants in respect of operations” : provision for the attribution of grants “to preserve and improve the natural environment, hygiene conditions and animal welfare standards” or “to promote the diversification of agricultural activities”, among others purposes (regulation 3).
Planning etc. (Scotland) Act 2006	No explicit reference, related implicit notions limited to the “cultural or historical significance” of some “trees, groups of trees or woodlands” (section 28) and “natural beauty” and “amenity”, “whether it is of historical, cultural or environmental importance”, linked to “any flora, fauna or physiographical features of the area, whether or not to any extent the product of human intervention in the landscape” (section 50).	Builds on the Town and Country Planning (Scotland) Act 1997 (see above). Section 1 : requirement to develop a National planning Framework to be laid before Parliament, with sustainable development as an objective. Section 2 : power to designate planning authorities responsible for the preparation of strategic development plans

		<p>and duty form local planning authorities to prepare local development plans. Both plans are subject to EIAs and the national sustainable development objective from section 1.</p> <p>Sections 3-4: compulsory consultation of SEPA and special consideration regarding potential impacts on protected areas and the environment in general when granting planning permission to marine developments.</p> <p>Sections 25-27: enforcement mechanisms (penalties, stop notices).</p> <p>Section 28: tree preservation orders</p>
<p>The Environmental Impact Assessment (Agriculture) (Scotland) Regulations 2006, Guidelines on Environmental Impact Assessment (EIA) for agriculture (2006), The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011</p>	<p>No specific integration.</p>	<p>Procedures to be followed in the case of agricultural development projects likely to have detrimental effects on the environment and therefore risking not to be granted planning permission. Coercive protection measure to avoid negative impacts on ecosystems.</p>
<p>Climate Change and Scottish Agriculture: Report and Recommendations of the Agriculture and Climate Change Stakeholder Group (ACCSG) (2008)</p>	<p>Explicit and comprehensive understanding of the ecosystem services concept: "In this respect, climate change may pose some fresh challenges, but the types of issues arising are relatively familiar from recent trends in the evolution of the expectations placed upon agriculture by society. That is, increasingly, agriculture and land use more generally are viewed not only as providing commodities such as wheat and beef, but also non-market benefits (public goods and externalities) such as ecosystem services and, as with GHG emissions, pollution reduction. Climate change offers yet another compelling argument for better co-ordination across different aspects of land use policy" (p. 26); "The</p>	<p>4 categories of recommendations (summarised p. 1-2):</p> <ul style="list-style-type: none"> - Research and development needs - Policy design needs: better cross-sector integration (agriculture, forestry, deer management, flooding and biodiversity), regulation and incentives. - Industry action needs: collaboration, especially from representative industry bodies to raise awareness and promote proactive behaviours. - Communication needs

	<p>development of an integrating framework is a useful first step. Such a framework relating to natural resources management is logically at the landscape level, and needs to be a 'coupled human-environment systems' framework taking into account the both the socio-economic and biophysical processes occurring at that level. In terms of mitigation and adaptation to climate change, two aspects need to be considered – (a) the choices that people in rural communities (in households or firms) make in relation to their energy consumption, their food, their transport, their adaptive responses, and in the case of land managers, the way that their land is used, and (b) the impact that these choices and their related actions have on the tradeoffs and synergies between different ecosystem services, and how this affects the sustainability of rural systems. Ecosystem services are nested within the origin and maintenance of biodiversity (cf. Millennium Ecosystem Assessment), i.e. they are functional processes generated by assemblages of species, and their interactions with the physical world. However, a deterministic relationship between biodiversity and ecosystem services remains uncertain, and any potential trade-offs between adaptation and biodiversity conservation represent a particular challenge to integrated decision-support frameworks based on socio-economic models, with biodiversity values widely acknowledged, though difficult to quantify” (p. 46).</p>	
<p>Deer policy: Scotland’s Wild Deer: A National Approach (2008), Code of Practice on Deer Management (2011, effective since 2012), Scotland’s Wild Deer: A National Approach – Action Plan 2013-2016 &</p>	<p>Implicit references to ES in the 2008 National approach: deer management to be integrated with other “ecosystem objectives” (p. 13). Wide set of objectives outlined in section 5 (pp. 9-12), including the maintenance and enhancement of “natural process”, climate change adaptation/mitigation, delivery of economic and social outcomes. Explicit and rather comprehensive reference to ecosystem services and</p>	<p>Code promoting sustainable deer management practices. Not compulsory yet recommended as non-compliance may trigger SNH intervention. Status laid out in a 2011 amendment to the Deer (Scotland) Act 2011: “It is not an offence to breach the Code. However, whether or not a person complied with this code could be used in</p>

<p>Report 2012/13, Scotland's Wild Deer: A National Approach, 2014 Review Including 2015 – 2020 Priorities</p>	<p>the ecosystem approach in both the 2012 (pp. 9, 12) and the 2014 (p. 7, 31, 37, 44) documents.</p>	<p>determining whether Scottish Natural Heritage (SNH) intervention, as laid out in the Deer (Scotland) Act 1996 (as amended) is required" (pp. 2, 4).</p> <p>Current policy (from the 2013 action plan and 2014 review): integration within the Land Use Strategy (2014: 8). Promotion of sustainable deer management and appropriate planning through training, promotion of the Code and SRDP funding (2013: 9-16; 2014: 23-27, 30, 33). Improve knowledge on deer population dynamics and impacts through targeted monitoring, research and training (2013: 16-14; 2014: 28-33, 37-38).</p>
<p>Wildlife and Natural Environment (Scotland) Act 2011</p>	<p>No explicit integration of the concepts. Elusive reference to "conserving, restoring, enhancing or managing the natural environment" (section 34).</p>	<p>Sections 2-13, 18-25, 33: wildlife protections measures, especially against hunting/poaching, including offences and penalties for wildlife crime.</p> <p>Sections 14-17: code of practice and control orders relative to non-native species.</p> <p>Sections 26-32: provisions relative to deer management amending the Deer (Scotland) Act 1996. Include the publication of a guide of good practice by SNH (see below).</p> <p>Sections 37-40: clarification of SNH duties and competences regarding SSSIs.</p>
<p>Our Rural Future: The Scottish Government's response to the Speak Up for Rural Scotland consultation (2011)</p>	<p>Mention to some services in relation with land use and "natural assets" management but not associated with ecosystem functioning: "Some land use choices are better considered at a landscape or catchment scale, in order to deliver wider-ranging benefits such as biodiversity enhancement, flood regulation, carbon management and the conservation of the historic environment. However, Scotland's natural assets do not look after themselves but require management which can be a resource intensive</p>	<p>Issue linked to the publication of the land use Strategy (see relevant entry).</p>

<p>Land Use Strategy (LUS): Getting the best from our land: A land use strategy for Scotland (2011, completed by the Land Use Strategy Strategic Environmental Assessment Screening and Scoping Report, 2010), Getting the best from our land: A land use strategy for Scotland – Action Plan 2011, Getting the best from our land: A land use strategy for Scotland – Progress Statement and Refreshed Action Plan 2014</p>	<p>activity” (p. 5).</p> <p>Explicit use of ES and related notions (“natural assets”, “green infrastructure”, “multiple benefits” – “natural capital” mentioned in the Screening and Scoping Report).</p> <p>Part 1, “A land use strategy for Scotland’s future”: “Principles for Sustainable Land Use”: “Land use decisions should be informed by an understanding of the functioning of the ecosystems which they affect in order to maintain the benefits of the ecosystem services which they provide” (p. 4).</p> <p>Part 4, “Land use and the environment”: “We can think of our natural environment as a series of living, interacting systems – ecosystems – of which people are an important part and biodiversity is a critical aspect. Ecosystems provide the natural services, or ecosystem services, that we need: goods such as food, timber, energy; services such as the purification of water and the regulation of the climate; and less tangible benefits such as opportunities for recreation, exercise, inspiration and reflection. Well-functioning ecosystems provide these services very cost-effectively compared with other alternatives. It has been estimated that the annual value of Scotland’s ecosystem services is over £20 billion. Although remarkable, this figure still may not be comprehensive, as many benefits such as enjoyment of landscapes cannot be valued readily in monetary terms. Despite this increasing recognition and understanding, the value of various ecosystem services is often not fully taken into account in decisions about land use. It will therefore be helpful to explore further how better recognition of ecosystems and their services might be built into decision-making so as to improve and sustain the benefits we receive from our land” (p. 17). As the climate changes we need to develop an approach that helps biodiversity to thrive in Scotland as a whole. Ecological pathways are important to form ecologically coherent</p>	<p>13 proposals setting the agenda and fixing policy objectives regarding sustainable land use.</p> <p>Proposals 1, 2: publication of an <i>ad hoc</i> Action plan and annual progress reports.</p> <p>Proposals 3, 5: convergence between the LUS, regulations and Scotland’s stance on CAP.</p> <p>Proposal 4: encourage private land-based industry to take action regarding climate change mitigation/adaptation.</p> <p>Proposals 6-7: use exemplars and expertise to promote good practice and tree planting to achieve multiple benefits and climate change actions</p> <p>Proposal 8: promote the ecosystem approach and provide guidance and advice, including Government publications.</p> <p>Proposal 9: contribute to the “long-term management of land-based carbon stores”, including the development of soil carbon accounting methods and further research to determine priorities</p> <p>Proposal 10: further research onto the land management/ecological processes relationship.</p> <p>Proposal 11: translate climate change adaptation policy into actions to be taken by communities</p> <p>Proposals 12-13: community engagement and information. Links with other strategies and legislation throughout the document (planning, forestry, flood risk management, climate change, economy, <i>etc.</i>, see notably pp. 5-6).</p> <p>The Action Plan(s): detail of related deliverables and milestones across policy sectors to provide an integrated, overarching vision. Including mapping, further</p>
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	<p>networks, and the National Planning Framework carries an action to develop a National Ecological Network. In parts of Scotland such networks are already in development. The Central Scotland Green Network, for example, is developing a green infrastructure, including woodlands, allotments, orchards, gardens. The aim is to make it a more attractive place to live, work and visit. At the same time, this green infrastructure is providing essential ecosystem services such as flood prevention, improved air quality and a reduction in noise and visual pollution, and the interconnected nature of the network is creating better habitats for wildlife. In other parts of Scotland, landscape-scale habitat restoration projects are being developed, for example in the Borders, the Trossachs and Glen Affric” (pp. 19-20).</p>	<p>regulations/ legislation, guidance notes to stakeholders, pilot schemes, enforcement through incentives and penalties, research.</p>
<p>Applying an ecosystems approach to land use: Information Note (2011)</p>	<p>Definition of an “ecosystems approach” building on an explicit, comprehensive and detailed understanding of “natural assets” and ecosystem services. “Explanation of an ecosystems approach. An ecosystems approach is a set of principles that can be applied to any plan or decision that may positively or negatively affect the environment, whether directly or indirectly. It is about making sure that we recognise and sustain the benefits provided by the environment whilst delivering other economic and social goals. The steps needed to implement an ecosystems approach can be summarised in three main principles: a) Consider natural systems – by using knowledge of interactions in nature and how ecosystems function.[...]Ecosystem function often shows a capacity to accommodate some change, but a significant impact may result when a threshold is crossed and capacity exceeded. b) Take account of the services that ecosystems provide – including those that underpin social and economic well-being, such as flood and climate regulation, resources for food, fibre or fuel, or for recreation, culture and quality of life. [...] All these services</p>	<p>Scottish Government research programme and policy development (p. 6): involvement of SEPA, SNH as well as research and higher education institutions as part of the Rural Affairs and Environment Strategic Research programme for 2011-2016; Project divided in “two programmes: ‘environmental change’ (including ecosystem services, water and energy sources and land management) and ‘food, land and people’ (including food supply, animal and plant health and vibrant rural communities)”. An ecosystems approach and Strategic Environmental Assessment (p. 7): recommendation to fold the approach into SEA – yet not compulsory. Examples of how an ecosystems approach is being applied: case studies (pp. 7-11): promotion of best practice.</p>

	<p>are supplied by our ecosystems. There are ways to account for some of these services using economic and other measures to inform policy and consider offsetting or mitigation.</p> <p>c) Involve people – those who benefit from the ecosystem services and those managing them need to be involved in decisions that affect them. Their knowledge will often be central to success. Public participation should go beyond consultation to become real involvement in decision-making” (p. 2). Note the consideration given to social mediations in the delivery of ES.</p> <p>“How an ecosystems approach may benefit decision-making The Millennium Ecosystem Assessment, a UN-sponsored study of ecosystems at a global scale, highlighted the effects that human activities have had on the world’s ecosystems and on the public benefits that ecosystems provide. A recent international report ‘The economics of ecosystems and biodiversity’ has said ‘Ecosystems don’t depend on economies but economies depend on ecosystems’. Describing the potential effects of plans or decisions on ecosystem services, and the economic and social consequences of these, helps to integrate and align economic, social and environmental policies. It may also help the public to engage better with decision-making by reflecting how they value places and by explaining the consequences of environmental impacts.</p> <p>Though we have always valued some services from the environment (food and other resources such as timber), we have taken many ecosystem services for granted and not fully factored them into our decisions. [...] Considering the potential impact of decisions which might inadvertently have an impact on these services allows us to ensure they are maintained. It may also allow us to increase the way in which the natural world benefits us and reduce the extent to which we need to take (often costly) action to prevent deterioration or avoid potentially catastrophic change” (p. 3). Acknowledgment of the inevitability of</p>	
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	<p>inter-ES trade-offs: “Dealing with competing expectations and conflicting priorities is an inevitable part of decision-making. For example, maximising some ecosystem services, such as hydropower or timber production, may negatively impact on recreational or conservation goals. There are also important and precious biodiversity resources that cannot be described in terms of ecosystem services. An ecosystems approach will help identify the key issues, evaluate the impact of the decisions and balance priorities” (p. 5).</p>	
<p>Making the most of communities’ natural assets: green infrastructure – An information note for Community Planning Partnerships on applying an ecosystems approach (2012)</p>	<p>No explicit mention of NC/ES but clearly builds on the 2011 Ecosystems approach information note and its objectives summarised pp. 4-5. “Green infrastructure” and its “multiple benefits” as main concepts used in the document. Definition p. 2: “What do we mean by nature? We mean natural assets like healthy soils and clean rivers, wild species and landscapes, peatbogs and woods, tidal mudflats and underwater reefs, urban parks and greenspace. Together these make up the green network of “green infrastructure” as essential to Scotland’s future as roads and railways, pipes and cables. Productive farmland is an essential part of Scotland’s natural assets, but green infrastructure usually refers to features in the landscape that provide benefits other than, or alongside, food production. This includes allotments which provide opportunities for communities to grow food as well as contributing to urban greenspace. Green infrastructure provides multiple benefits:</p> <p>Place-making – by improving the image of a place, giving it a distinctive identity and sense of place, boosting property values and attracting economic investment.</p> <p>Flooding and water management – by protecting against flooding and improving resilience to climate change. Living roofs, large trees and soft landscape areas absorb water.</p> <p>Energy and carbon management – by saving energy costs. Living roofs insulate buildings, and trees shade</p>	<p>Explanation of the guiding principles and rationale, with links to further literature (pp. 3-7, 10-11). Promotion of best practice through exemplar projects (pp. 7-9, 11-12).</p>

	<p>offices which reduces the need for air conditioning. Trees provide fuel and many natural habitats, store carbon, helping to reduce greenhouse gas emissions.</p> <p>Clean air and tranquillity – by helping to improve air quality and reduce noise.</p> <p>Health and wellbeing – by improving opportunities for access to nature and outdoor space for exercise, recreation, and reflection.</p> <p>Education – by providing a resource for outdoor learning.</p>	
<p>SNH Information Note: Green Networks in Development Planning (2012)</p>	<p>Notions related to ES/NC but using an alternative terminology:</p> <p>“Green networks can also deliver a wide range of other benefits: improving health and well-being, enhancing biodiversity, helping to mitigate against climate change, providing business and educational opportunities, encouraging tourism and promoting sustainable use of scarce land resources” (p. 2).</p> <p>“Multi-functionality can be defined as: The ability to provide multiple or ‘cross-cutting’ functions, by integrating different activities and land usage, on individual sites and across a whole green infrastructure network” (p. 3).</p>	<p>Guidance and illustration of best practice, including list of delivery mechanisms and planning requirements (pp. 4-5).</p>
<p>Protecting Plant Health: A Plant Biosecurity Strategy for Great Britain (2014)</p>	<p>Explicit reference to ecosystem services, but only as a <i>result</i> of plant health (pp. 5, 23). No mention of the role of functioning ecosystem in reducing disease risks.</p>	<p>Mostly a statement of intent. Proposed measures do not build on an understanding of ES since they are seen as an outcome of the strategy.</p>
<p>Scottish Planning Policy (2014), as well as Scottish Planning Policy (2010) for reference</p>	<p>Explicit reference to ES: “The planning system should:</p> <ul style="list-style-type: none"> • facilitate positive change while maintaining and enhancing distinctive landscape character; • conserve and enhance protected sites and species, taking account of the need to maintain healthy ecosystems and work with the natural processes which provide important services [...] • promote protection and improvement of the water environment, including rivers, lochs, estuaries, wetlands, coastal waters and groundwater, in a sustainable and co-ordinated way; • seek to protect soils from damage [...] • protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woods, hedgerows and individual trees with 	<p>Mostly a statement of intent providing guidelines. Yet <i>de facto</i> represent an integration of different planning rationales including biodiversity and habitat protection/enhancement, as the 2010 policy combines and revokes 21 previous publications.</p> <p>Specific guidance regarding:</p> <p>Valuing the Natural Environment (pp. 45-49). Green infrastructure (pp. 50-52).</p>

	<p>high nature conservation or landscape value;</p> <ul style="list-style-type: none"> • seek benefits for biodiversity from new development where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats; and • support opportunities for enjoying and learning about the natural environment” (p. 45), “The planning system should: • consider green infrastructure as an integral element of places from the outset of the planning process; • assess current and future needs and opportunities for green infrastructure to provide multiple benefits; • facilitate the provision and long-term, integrated management of green infrastructure and prevent fragmentation; and • provide for easy and safe access to and within green infrastructure, including core paths and other important routes, within the context of statutory access rights under the Land Reform (Scotland) Act 2003” (p. 50), “The benefits people obtain from ecosystems; these include provisioning services such as food, water, timber and fibre; regulating services that affect climate, floods, disease, waste and water quality; cultural services with recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis and nutrient cycling”, “Green infrastructure: Includes the ‘green’ and ‘blue’ (water environment) features of the natural and built environments that can provide benefits without being connected” (p. 72), “Green networks: Connected areas of green infrastructure and open space that together form an integrated and multi-functional network” (p. 73). 	
<p>Ambition, Opportunity, Place: Scotland’s Third National Planning Framework (2014), as well as previous version for reference: National Planning Framework for Scotland: Guidance</p>	<p>Precursors of the NC/ES concept in the first Framework: “environmental benefits” (pp. 3, 84), connection environment-cultural heritage/identity (pp. 5, 31), “natural resources” and recreation (pp. 16, 81), “environmental capital/assets” (pp. 44, 73), “environmental improvement” through the establishment of “green networks” (pp. 45, 48-49, 72, especially in the case of the Central Belt p. 69).</p>	<p>Frameworks 1 and 2: “statements of needs” pointing at desirable developments. Framework 2 introduces the Central Scotland Green Network (pp. 91, 202, 226-227). NPF3: Linkage with other key policies supporting ES maintenance and improvement (2020</p>

<p>for the spatial development of Scotland to 2025 (2004), National Planning Framework for Scotland 2 (2009)</p> <p>National Planning Framework 3 Action Programme (online, last retrieved 18/07/2015)</p>	<p>Juxtaposition of “ecosystems” and “services” in the second Framework in reference to water and flood risk management: “The Government is committed to an integrated approach to the management of water, encompassing environmental protection, public health, flood risk management, the supply and drainage infrastructure required for development, and aquaculture. Improving the quality of the water environment can help to create healthier ecosystems, deliver substantial amenity and recreational benefits and contribute to urban regeneration. The Water Environment and Water Services Act 2003 provides a framework for the sustainable management of water resources” (p. 70). Also development of the “environmental benefits” notion: “environmental benefits such as enhanced amenity, improved water, soil and air quality and greater biodiversity”, “it is important that woodland expansion is managed so that the environmental benefits are not reduced as a result of adverse impacts on other assets, including water resources, landscape and cultural heritage” (idea of trade-offs between services, pp. 34, 36), “design of catchment management measures, flood risk reduction works and use of best practice in sustainable drainage schemes to deliver wider environmental benefits” (p. 19). Apparition of the phrase “green infrastructure” (pp. 17, 86), alongside “ecological networks” (pp. 34, 69). Explicit reference to ES in the Third Framework (p. 43). More particularly connected to rural development (p. 47), and climate change adaptation (p. 64). “A strategic approach to green infrastructure” (p. 17) linked to education, community-building and quality of life (pp. 44-46). No reference to “natural capital” but “natural assets” (pp.1-5, 32, 68, linked to ES pp. 44-45, 50)</p>	<p>Challenge for Scotland’s Biodiversity, Land Use Strategy, Low Carbon Scotland: Report of Proposals and Policies, National Marine Plan, Regeneration Strategy). Support to 2 National Developments building on ecosystem services and a landscape approach (“build a natural, resilient place” dimension of the strategy”): the Central Scotland Green Network and the Metropolitan Glasgow Strategic Drainage Partnership (p; 64). Principles quoted in the conceptual column to drive other developments. Further details in the Action Plan, with integration of the NPF3 objectives with RBMP, flood risk management plans (to be published in 2016), peatland restoration and woodland expansion.</p>
<p>CAP in Scotland, as summarised in The new Common Agricultural Policy</p>	<p>NC/ES not explicitly mentioned, yet in practice the CAP provides payment in return for the protection/ enhancement of some ecosystem services to achieve</p>	<p>Pillar 1: payments subjects to cross-compliance criteria, additional funding for three types of “greening” measures</p>

<p>in Scotland: An introduction to what it means for you (2014)</p>	<p>the delivery of multiple benefits by farms.</p> <p>Pillar 1 (pp. 5-8), direct payments, is conditional to cross-compliance “with regulations on public health, animal and plant health, environmental protection and animal welfare” set out in Scottish regulations (see below). “Greening” actions undertaken “to protect biodiversity and reduce emissions” also rewarded (p. 3).</p> <p>Pillar 2 (pp. 9-10) relates to the Scottish Rural Development Programme (SDRP, see below). Scotland has chosen “protecting and enhancing our environmental assets” as one of the priorities of its RDP, corresponding to the European objective of “restoring, preserving and enhancing ecosystems related to agriculture and forestry” (Regulation (EU) No 1305/2013, article 5(4)). The Programme promotes several ES-delivering activities such as multi-purpose forestry or agri-environmental climate projects.</p>	<p>(crop diversification, permanent grassland in sites of specific scientific interest, and ecological focus areas). See relevant regulations below.</p> <p>Pillar 2: funding for various developments directly related to NC/ES, namely forestry, agri-environment climate (AEC) and components of the Beef Package. Support for advice and monitoring under the Knowledge Transfer and Innovation Fund (KTIF), an Advisory Service and technical assistance. Enabling through the Less Favoured Areas Support Scheme (LFASS), Support for Cooperative Action, Business/Food and drink support, and LEADER initiatives, as well as for new entrants, crofting, small farms and Rural Network promoting best practices. See the SRDP itself and supporting regulations below for details.</p>
<p>CAP Pillar 1 Regulations: The Common Agricultural Policy (Cross-Compliance) (Scotland) Regulations 2014, The Common Agricultural Policy (Direct Payments etc.) (Scotland) Regulations 2015 (amended 2015)</p>	<p>No explicit reference to NC/ES, yet implicit connection as these regulations implement CAP measures detailed above.</p>	<p>2014 Regulations: cross-compliance criteria.</p> <p>Schedule Part 2: “Standards for Good Agricultural and Environmental Condition” including the establishment of buffer strips along water courses, use of water for irrigation in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011, protection of groundwater against pollution, minimum soil cover, minimum land management reflecting site specific conditions to limit erosion, maintenance of soil organic matter, retention of landscape features.</p> <p>2015 Regulations: definition for the purpose of the EU Direct Payments Regulations 1307/2013 of the following: crop diversification (regulation 16), permanent grasslands (regulations 17, 5), Ecological Focus Areas (land lying fallow,</p>

		buffer strips, areas with catch crops or green cover and areas with nitrogen-fixing crops, landscape features, regulation 18, Schedule 2) and short rotation coppice (regulation 7).
<p>Scottish Rural Development Programme: United Kingdom – Rural Development Programme (Regional) – Scotland (2014, last modified 2015)</p>	<p>ES explicitly cited in the strengths, weaknesses, opportunities and threats (SWOT) analysis in relation with biodiversity and habitat conservation but with a comprehensive list of the benefits it provides (pp. 33-35): “The EU Biodiversity Strategy provides the overarching policy framework for addressing biodiversity challenges through the SRDP. The SRDP responds to the headline target to halt the loss of biodiversity and the degradation of ecosystem services through addressing six targets within the Strategy: [...] 2 Better protection and restoration of ecosystems and the services they provide: ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems; 3 More sustainable agriculture and forestry: conservation of biodiversity with a measurable improvement in the conservation status of species and habitats and in the provision of ecosystem services”,.</p> <p>“Peatland restoration is identified as a key priority in the PAF due to its target habitats/species and the carbon sequestration value”.</p> <p>“HNV farmland was estimated to account for 44% of the UAA in Scotland in 2013, mainly concentrated in hills and islands of the north and west, where land use is constrained by climate, soils and topography. Although these areas are typically associated with high biodiversity and delivery of a range of ecosystem services, they are subject to a range of pressures, principally related to inappropriate grazing management”.</p> <p>“The 2011 UK National Ecosystem Assessment (NEA) reported that 44% of ecosystem services delivered by Scottish habitats are in decline, with only 16.5% improving. Within enclosed farmland habitats in Scotland, wild</p>	<p>Funding through various schemes (see “CAP in Scotland” above).</p>

	<p>species diversity, water supply, soil quality and regulation of climate, hazards, pests and diseases have shown some deterioration over the last 20 years, and the abundance of wild and domestic pollinators has also declined. The NEA noted an increase in provisioning services, especially from agricultural systems, over the last 70 years has had significant impact on biodiversity in Scotland with declining capacities of all ecosystems to support sustained use".</p> <p>Measures 08 (pp. 248-250), 10 (p. 258) and 15 (p. 578) explicitly cite ES provision and strengthening as an underpinning rationale and a desired outcome.</p>	
<p>CAP Pillar 2 Regulations: The Less Favoured Area Support Scheme (Scotland) Regulations 2010 (amended 2015), The Rural Development (Scotland) Regulations 2015 (completed by the corresponding Policy Note), The Crofting Counties Agricultural Grants (Scotland) Variation Scheme 2015</p>	<p>No explicit reference to NC/ES, yet implicit connection as these regulations implement the SDRP</p>	<p>2010 LFASS Regulations: funding arrangements for the Less Favoured Area Support Scheme</p> <p>2015 Rural Development Regulations, part 3: funding arrangements for most of the Rural Development grants apart from those covered by separate regulations (LFASS, CAGS, see policy Note for details), with specific provisions for the LEADER Grant (through which the Small Farms Grant is also delivered, regulations 7-10).</p> <p>2015 Crofting Regulations: integration of the European Crofting Agricultural Grant Scheme to the Scottish funding available through the Crofting Counties Agricultural Grants (Scotland) Scheme 2006.</p>

E.3. Policy assessment

Conceptual integration: Explicit in the latest policy documents but overall incomprehensive. The concepts of ecosystem services and green infrastructure are clearly referred to in the most recent texts, especially the documents implementing the 2014-2020 CAP (and more particularly the SRDP) and the 2011 Land Use Strategy. Yet the extent to which these notions are used varies greatly from one component of this cluster of policies to the other. The promotion of the ecosystem approach in planning and land use has led to a comprehensive vision of interactions between human activities and ecosystem flowing both ways, the 2011 information note Applying an ecosystems

approach to land use constituting a good example of the progress made in this sector. On the other hand, agricultural policy continues to resort to a univocal understanding of these relationships. On farming issues, the integration of ES/NC has translated into support for diversification and mitigation measures without questioning current production principles and practices. Documents emphasise new outcome opportunities and environmental compensation techniques but do not fully recognise the role of agroecosystem functions have always had in supporting food and fibre provisioning. The various frameworks and regulations relative to plant and animal health completely fail for instance to identify how ecosystem services contribute to the achievement of policy objectives. This uneven integration of the concept strongly transpires from the 2015 Scottish Rural Development Programme, where the sections related to forestry abundantly refer to multifunctionality and ES as “increase[ing] the robustness” of the sector while measures for agriculture are much more implicit and incomprehensive with regards to ES/NC (SG, 2015[2014]: 249).

Operational integration: Explicit but incomprehensive. Once again operational integration reflects conceptual integration and its potential shortcomings. The Land Use Strategy and the related Action Plan propose a comprehensive framework supposed to integrate policies across sectors. One of the highlights resides in the repeated need for further research and monitoring to inform policy-making, pointing at persistent gaps in knowledge to elaborate proactive measures. Scottish policy also stresses some aspects of social mediation in the delivery of ecosystem benefits to society by promoting access and community land acquisition (Land Reform (Scotland) Act 2003). Overall environmental enhancement is promoted through guidance, communications and financial support in the case of relatively well-understood ecosystem services such as recreation and carbon storage (flood risk management, green infrastructure and natural heritage management in both in planning and agricultural policy, agri-environment-climate action in the CAP, see Annex D for details). Inversely poorly-recognised and insufficiently-researched ecosystem services such as nutrient cycling or pest control are not addressed beyond damage control. Ultimately the impact of these instruments is limited by the willingness of private landowners and planning authorities to seize and implement the policies. Planning decisions leave some degree of interpretation to authorisers in their enforcement of the available framework and guidelines, as well as in the way they chose to balance different objectives. The implementation “pillars” on which agricultural and rural development policy has been erected are funding schemes. Even though compliance controls are undertaken to verify the legitimacy of claims, the efficiency of the programme relies on their take-up by farmers.

F: Marine and coastal environment, including fisheries

F.1. Policy documents reviewed

Great Britain (2009) *Marine and Coastal Access Act 2009*. Elizabeth II, Chapter 23 (2009). London: The Stationery Office.

HM Government, Northern Ireland Executive, Scottish Government, and Welsh Assembly Government (2009) *Our seas – a shared resource: High level marine Objectives*. London: Department for Environment, Food and Rural Affairs, 1 January.

——— (2011) *UK Marine Policy Statement*. London: The Stationery Office, 30 September.

Scotland (2003) *Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003*. Elizabeth II, Asp 15 (2003). London: The Stationery Office.

——— (2004) *The Conservation of Seals (Scotland) Order 2004*. Elizabeth II, 2004 No. 283. London: The Stationery Office.

——— (2007) *The Conservation of Seals (Scotland) Order 2007*. Elizabeth II, 2007 No. 126. London: The Stationery Office.

——— (2007) *Aquaculture and Fisheries (Scotland) Act 2007*. Elizabeth II, Asp 12 (2007). London: The Stationery Office.

——— (2009) *The Aquatic Animal Health (Scotland) Regulations 2009*. Elizabeth II, 2009 No. 85. London: The Stationery Office.

——— (2010) *Marine (Scotland) Act 2010*. Elizabeth II, Asp 5 (2010). London: The Stationery Office.

Scottish Executive (2003) *A Strategic Framework for Scottish Aquaculture*. Edinburgh, March.

Scottish Government (2009e) A Fresh Start: The renewed strategic framework for Scottish aquaculture. Edinburgh, May.

——— (2010d) Making the most of Scotland’s seas: turning our marine vision into reality. Edinburgh, April.

F.2. Content analysis: summary table

Document	Conceptual integration	Operational integration
Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003	No specific mention of ES/NC, yet the operational measures introduced by this Act show some command of ecosystem science and corresponding thinking (see for instance section 36, extending the boundaries of salmon fishery districts to include a 5-km radius around estuaries, thus recognising some inter-habitat connectedness).	Part 1 regulates freshwater fishing by limiting the methods and periods of fishing. Part 2 to 5 update the governance of salmon and freshwater fisheries, by modifying district boundaries, board membership, offences and enforcement procedures;
Aquaculture and Fisheries (Scotland) Act 2007	No explicit specific integration of ecosystem-relayed concepts. Vague link between fish conservation and fishing.	Sections 24 and 38 evoke ministerial involvement on fishing matters for environmental reasons.
A Strategic Framework for Scottish Freshwater Fisheries (2008)	No explicit reference to E/NC. However implicit overlap between the economic exploitation of freshwater fisheries and freshwater habitats: “freshwater fish and their habitats are a natural resource in Scotland, and the economic and social benefits to be gained from utilising this resource must be balanced against the threat of over-exploitation” (p. 1) “we believe that there is sufficient physical, environmental and fisheries resource capacity in Scotland to enable the sector to grow at a controlled rate whilst remaining sustainable’ (p. 11), Token mention of the ecosystem approach in the glossary despite not being used in the framework (p. 49).	Framework prepared by a Freshwater Fisheries Forum Steering Group convened by the Scottish Government since 2004 (pp. 3, 37-38). Mostly a statement of intent yet identifies priorities (pp. 16-33): promotion of best practice and cooperation, including marketing, provision of information, targeted research, dedicated legislation (not completed despite the inclusion of some aspects in the Aquaculture and Fisheries (Scotland) Act 2013).
The Aquatic Animal Health	No link made between fish and shellfish health and the environment or even pollution.	No instruments designed to address

(Scotland) Regulations 2009		ES/NC.
Our seas – a shared resource: High level marine Objectives (2009)	Policy statement built around the idea of improving ecosystem health and resilience to maximise benefits, with explicit use of the ecosystem approach notion. Here again token mention of a concept promoted by European institutions in the glossary with no in-text reference: “ecosystem goods and services”.	Very high level policy statement, with broad objectives. See the 2011 UK policy statement for a more detailed version.
Marine and Coastal Access Act 2009	Sustainable management of the UK marine area is the main driver behind this Act, yet ecosystem services of connected terms are not explicitly mentioned.	Act important for Scotland to the extent that it makes provision for the Marine (Scotland) Act 2010 by introducing the requirement of issuing marine plans. Sections 194 to 214 also amend the 1967 Sea Fisheries Acts by tightening fish and shellfish catching requirements.
A Fresh Start: The renewed strategic framework for Scottish aquaculture (2009); A Strategic Framework for Scottish Aquaculture (2003) for reference.	No clear association between fishing and ecosystems, “benefits” mostly linked to fishing practices (rather than ecological processes, pp. 4, 15-16). Yet mention of “assets” and the “ecosystem approach” but without further details (pp. 5, 15-16). The 2003 strategy makes a more appropriate use of the ecosystem approach, explicitly referring to “identification of fundamental or sensitive ecological processes to ensure that relevant pollutants do not reach concentrations which would interfere with the natural balance and variation of those processes” (p. 23).	Action plan, in which proposed measures focus on “containment” and “minimising impacts on the environment”, mostly through Strategic Environmental Assessments (pp. 6, 16-20). Creation in 2002 of the Ministerial Working Group on Aquaculture (MWGA), reorganised in 2009 (p; 6).
Marine (Scotland) Act 2010; part 6 adding to The Conservation of Seals (Scotland) Order 2004 and The Conservation of Seals (Scotland) Order 2007.	ES/NC not explicitly mentioned, yet the Act promotes a vision of marine planning integrating environmental, social and economic considerations. “Enhancement of the health of the Scottish marine area” and “mitigation of and adaptation to climate change” presented as the main general duties outlined in Part 2 . Part 3 refers to “economic, social and marine ecosystem objectives” as objectives for marine planning (section 5(4)). In Part 4 , repeated association between “the environment”, “human health” and “legitimate uses of the sea” (sections 21(4), 27(1), 30(3), 32(4), 43(3), 44(3), 55(4), 59(1,2)). Part 5 devoted to marine “protection and enhancement”. Section 79 cites the creation of a network of conservation sites as	Part 3, Schedule 1: establishes the duty for ministers to prepare a national marine plan fixing “economic, social and marine ecosystem objectives”. Part 4 establishes the compulsory licensing of marine activities, introducing provisions for inquiring, reporting, interdictions, revocations and offenses. Part 5 makes provision for the designation of marine protected areas

	<p>“contribut[ing] to the conservation or improvement of the marine environment in the UK marine area”.</p> <p>Implicit resort to the notion of trade-offs between sites and the services they provide in section 91: “The assessment must include an assessment of the extent to which the restriction or prohibition of the activity has had and may have an impact on— (a) economic interests, (b) social interests, (c) the environment within the protected area, (d) the environment elsewhere in the Scottish marine area as a result of the activity being displaced”.</p> <p>Also used in section 110 and 121 on seal licenses (trade-off between a species, the overall environment and human wellbeing).</p>	<p>(MPAs) on nature conservation, demonstration and research, and historic grounds, with the creation of a network of such sites as an objective. Ministers can issue marine conservation orders concerning the objectives and management of MPAs. Sections 94-98 make provision for associated offenses.</p> <p>Part 6 prohibit the “killing, injuring or taking” of seals unless a licence has been issued to this end. Sections 117-124 make provision for the designation of protected sites with barriers to entry. Sections 126-129 detail enforcement powers and penalties.</p> <p>Part 7 lists enforcement powers and offences relevant to both marina planning and marine environment protection.</p>
<p>Making the most of Scotland’s seas: turning our marine vision into reality (2010)</p>	<p>Implicit reference to ES: “Most of Scotland’s coastal waters and seas are already clean, healthy and safe. We need to protect them, and safeguard the ecosystems and natural assets they support, as the basis for increasing productivity and sustainable economic growth”, “protecting and enhancing our most important marine heritage assets in such a way that they can be valued, understood and enjoyed” (p. 2).</p>	<p>“Declaration of intent”, yet affirms a commitment to integrated marine planning (p. 6), and recognises the need for “a more integrated evidence base that allows us to understand the functioning of marine ecosystems and the impact, both individually and cumulatively, of human activities”, “effective tools and resources, for developing a Marine Plan and, in particular, for making choices between different uses”, and an integrated conservation strategy (p. 7).</p>

		Integration of marine planning with climate change mitigation and adaptation policy (pp. 2, 6).
UK Marine Policy Statement (2011)	<p>Single explicit mention of “ecosystem goods and services including provision of food and regulation of the climate” (p. 16, corresponding to the terminology used in European texts – 2008/56/EC), but extensive use of the ecosystem approach concept (see definition p. 4).</p> <p>Links made between ecosystem health and potentially conflicting “legitimate uses of the sea” (p. 12), as well as “social and economic benefits that the enhancement of marine ecosystems can provide”.</p> <p>“The general acceptance of biodiversity’s essential role in enhancing the quality of life, with its conservation becoming a natural consideration in all relevant public, private and nongovernmental decisions and policies”</p>	<p>Emphasis on the limitation of negative impacts (pp. 17-22), with a more proactive stance adopted on flood control and climate change adaptation (pp. 23-25).</p> <p>Considerations relating to marine protected areas (pp. 27-28).</p> <p>Outline of the “potential impact” of a range of human activities including improvement opportunities and their positive contribution to wellbeing (pp. 28-47).</p>
Scotland's Marine Atlas: Information for the national marine plan (2011).	Data implicitly meant to allow the mapping of ES/NC.	Decision-support instrument.
Marine Scotland Strategic Plan 2010-2013 (2010), updated by the Marine Scotland Strategic Framework 2013-2016 (2013).	<p>No direct reference to ecosystems or related concepts, except scarce mentions of biodiversity in the 2010 plan (pp. 4, 9, 14). However, these documents reveal some understanding of the importance of the health of marine ecosystems in supporting human wellbeing and economic activities (links between biodiversity and sustainable sea management, aim to “[grow] the overall economic value of the marine environment in a sustainable way” pp. 4-5, “integrated approach” to marine planning pp. 10-11).</p>	<p>Action plan based on “enhance[ing] the science and evidence base; integrat[ing] and streamlin[ing] licensing and consenting arrangements; develop[ing] our cross-cutting approach to marine nature conservation; develop[ing] more integrated compliance monitoring and enforcement arrangements” (2010: p. 16).</p> <p>Indicators and objectives detailed in the 2013 update.</p>
Aquaculture and Fisheries (Scotland) Act 2013	<p>No explicit reference to ES/NC.</p> <p>Understanding of the aquaculture and fisheries/ecosystems interaction limited to the negative impacts of human activities on the environment except in two instances.</p> <p>First, an acknowledgement of the impact that population dynamics and inter-species</p>	Part 1: provisions for the regulation of aquaculture, including planning permissions (section 23), control mechanisms (sections 16-21) and measures

	<p>competition have on the production of ecosystem goods through the concept of “commercially damaging species” (Part 1, chapter 3 in general, section 11 in particular). Second, a more proactive approach outlined in relation to shellfish waters including not only their protection but also their potential “improvement” (Part 4).</p>	<p>against “commercially damaging species” (sections 11-15). Part 3: compliance with European fisheries policy. Part 4: management of shellfish waters, including enforcement powers (sections 54-58).</p>
<p>Planning Circular 1/2015: The relationship between the statutory land use planning system and marine planning and licensing</p>	<p>Technical document supporting the plan below, which does explicitly build on the ES/NC framework.</p>	<p>Harmonises terrestrial and marine planning procedures.</p>
<p>Scotland’s National Marine Plan: A Single Framework for Managing Our Seas (2015)</p>	<p>Explicit and repeated reference to ecosystem goods and services in the introductory sections presenting the policy’s overall goals and vision (pp. 11-34). Quite interestingly ES delivery is not only connected to biodiversity by also to “geodiversity”, displaying a relatively elaborate understanding of the ecological dynamics at play. Benefits generated through the sustainable management of Scotland’s sea are classified using the following categories: economic, social, environmental, climate change mitigation and climate change adaptation (p. 8, 12). Note the latter having their own separate categories.</p> <p>The ecosystem services covered by policy form a rather comprehensive account of the ways in which ecosystem functions contribute to human wellbeing. Overarching services influencing subsectors are identified in the “General policies” sections (climate change pp. 18-19, heritage and aesthetic value pp.19-22, regulating/supporting role in species stock and flood risk management of biophysical features of the marine environment pp. 22-30, health through air and water quality pp. 30-31). The sections on productive subsectors like fisheries and aquaculture focus on provisioning services (pp; 37-63), while the one on recreation and tourism highlights cultural services (pp. 89-97). Individual services are alternatively presented as supporting each other in some instances (with the concept of “co-existence” presented in pp; 17-18) but also requiring trade-offs in others (see for instance p; 37, on fisheries: “The following key factors should be taken into account when deciding on uses of the marine</p>	<p>As stated in the Marine and Coastal Access Act 2009 and the Marine and Coastal Access Act 2009, this Plan sets out the criteria on which public authorities must base planning decisions relating to marine and fishing licensing, aquaculture development consents and port and harbours development (pp. 1, 6). The plan also makes provision for convergence with RBMPs (p. 8). 21 general planning principles are outlined (pp. 15-34) to answer the following wider objectives: achieving a sustainable economy, ensuring a strong, healthy and just society, living within environmental limits, promoting good governance, and using sound science responsibly. Decision supporting documents exist in the form of Scotland’s Marine Atlas:</p>

	<p>environment and the potential impact on fishing: • The cultural and economic importance of fishing, in particular to vulnerable coastal communities. • The potential impact (positive and negative) of marine developments on the sustainability of fish and shellfish stocks and resultant fishing opportunities in any given area. • The environmental impact on fishing grounds (such as nursery, spawning areas), commercially fished species, habitats and species more generally. • The potential effect of displacement on: fish stocks; the wider environment; use of fuel; socio-economic costs to fishers and their communities and other marine users”).</p>	<p>Information for the National Marine Plan and “an interactive GIS portal – National Marine Plan interactive (NMPi)” (p. 2). This plan also makes provisions for the drafting of regional ones (pp. 4-5, 10).</p>
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F.3. Policy assessment

Conceptual integration: Explicit and comprehensive in the latest documents. The publication in 2015 of Scotland’s National Marine Plan – with accompanying memos – marks a turning point in the sense that it is almost the first explicit and comprehensive mention of the ES/NC framework in Scottish marine policy. After encouraging signs in 2003 with A Strategic Framework for Scottish Aquaculture and its correct use of the ecosystem approach notion, policy documents from the late 2000s show a limited understanding of the ES/NC concepts. European-promoted terminology reappears in UK-wide policy statements in 2009-2010 while Scottish policy increasingly shows an implicit understanding of the framework, the idea of trade-offs between the environment and human activities being particularly well articulated in the policy. All-encompassing marine planning constitutes the logical next step of this gradual integration, with coastal and maritime ecosystem conceived as an integrated environment.

Operational integration: Explicit and comprehensive in intent but with a limited range of available instruments. Planning permissions and licensing constitutes the main policy instrument through which Scottish authorities intervene on maritime issues. These used to focus on the reduction of negative impacts of human activities on marine ecosystems, especially those caused by industrial fishing and agriculture. The 2015 National Marine Plan introduces an integrated vision of Scottish marine areas meant to guide competent authorities when issuing permissions. Paired with data taking into account the spatial localisation of marine ecosystem services, this plan provides planning authorities with the tools to maximise the benefits Scottish communities derive from the sea. Even if proactive enhancement measures remain limited to the creation of a network of protected areas and the promotion of good practices through planning, the policy can be seen to provide instruments that explicitly and comprehensively address ecosystem services issues. Yet the question of their effectiveness remains.

G: Climate change

G.1. Policy documents reviewed

Department for Environment, Food and Rural Affairs (2012) UK 2012 Climate Change Risk Assessment – Scotland (summary). Report, London: The Stationery Office, January.

Great Britain (2008) *Climate Change Act 2008*. Elizabeth II, Chapter 27 (2008). London: The Stationery Office.

Heath M, Moxley J, Buys G et al. (2013) Projections to 2050 of emissions and removals from the LULUCF sector in Scotland, England, Wales and Northern Ireland. Report for the Department of Energy and Climate Change, Penicuik: Centre for Ecology and Hydrology, September.

Scotland (2009) *Climate Change (Scotland) Act 2009*. Elizabeth II, Asp 12 (2009). London: The Stationery Office.

——— (2010) *The Carbon Accounting Scheme (Scotland) Regulations 2010*. Elizabeth II, 2010 No. 216. London: The Stationery Office.

——— (2012) *The Forestry Commissioners (Climate Change Functions) (Scotland) Order 2012*. Elizabeth II, 2012 No. 77. London: The Stationery Office.

Scottish Government (2008c) News Release: Climate Challenge Fund. Edinburgh, 17 September

——— (2009f) Scotland's climate change adaptation framework. Edinburgh, December.

——— (2013a) Low carbon Scotland. Meeting the emissions reduction targets 2013-2027: The second report on proposals and policies. Edinburgh, June.

——— (2014l) Climate Ready Scotland: Scottish Climate Change Adaptation Programme. Edinburgh, May.

——— (OnlineH) Climate Challenge Fund. Accessed 15 July 2015. Available at:

<http://www.gov.scot/Topics/Environment/climatechange/ccf>

G.2. Content analysis: summary table

Document	Conceptual integration	Operational integration
<p>Climate Change Act 2008</p>	<p>No clear specific integration of the NC/ES concepts. Brief reference to “the protection or enhancement of the environment” but only as an amendment to the Energy Act 2000 included in this Act.</p> <p>See Schedule 1, section 1(3) for the need to include in the advisory Committee on Climate Change members “having expertise or experience” in ‘climate science and other branches of environmental science’ for another tenuous suggestion of the role of ecosystems to contribute to climate change mitigation and adaptation.</p>	<p>Part 1 (sections 1-31): establishment of a UK-wide greenhouse gases reduction target for 2050 representing an 80% decrease from the 1990 baseline, with accounting and budgeting guidelines. No precision as to how this target is to be met, yet duty to develop “proposals and policies” (sections 13-15).</p> <p>Part 2 (sections 31-43) and schedule 1: establishment of a dedicated advisory body, the Committee on Climate Change, including members “having expertise or experience” in ‘climate science and other branches of environmental science’. Duty to advise the Secretary of State and authorities enquiring on climate change mitigation and adaptation.</p> <p>Part 3 (sections 44-55) and schedules 2-4: possibility for relevant authorities to “make provision by regulations for trading schemes relating to greenhouse gas emissions”, that either consist in “limiting or encouraging the limitation of activities that consist of the emission of greenhouse gas or that cause or contribute, directly or indirectly, to such emissions” or “encouraging activities that consist of, or that</p>

		cause or contribute, directly or indirectly, to reductions in greenhouse gas emissions or the removal of greenhouse gas from the atmosphere”.
Climate Challenge Fund (launched in 2008): SG press release (2008), SG Climate Challenge Fund webpage (2010, last retrieved 15/07/2015)	N/A	Specific funding provided through the Sustainable Action Fund, established by the Environmental Protection Act 1990.
Climate Change (Scotland) Act 2009	<p>No clear specific integration of the NC/ES concepts. Vague reference to “environmental improvement” but only as the outcome of one of the “other climate change provisions” outlined in Part 5, namely the carrier bag charge: “The Scottish Ministers may, by regulations, require suppliers of goods—[...] (b) to apply the net proceeds raised by such charges to the advancement of environmental protection or improvement or to any other purposes that may be reasonably regarded as analogous” (Section 88).</p> <p>See Schedule 1, section 2(4) for the need to include in the advisory Scottish Committee on Climate Change members “having expertise or experience” in ‘climate science and other branches of environmental science’ for another tenuous suggestion of the role of ecosystems to contribute to climate change mitigation and adaptation.</p>	<p>Part 1 (sections 1-23): establishment of an interim target for 2020 (4%) on top of the UK greenhouse gases reduction one, reviewable depending on expert advice and to be translated into annual objectives. No precision as to how these targets are to be met. Protection against detrimental impact on ecosystem in section 2(5) and 4(5), with attention given to “environmental considerations and, in particular, the likely impact of the targets on biodiversity” when setting and seeking advice on targets.</p> <p>Part 2 (sections 24-32) and schedule 1: establishment of a dedicated advisory body, the Scottish Committee on Climate Change, including members “having expertise or experience” in ‘climate science and other branches of environmental science’.</p> <p>The Committee must monitor progress and provide Ministers with advice on how to meet targets. Note that “when</p>

		<p>providing advice under subsection (1)(a), the advisory body must also express a view as to— [...] (c) the respective contributions towards meeting the annual targets that should be made by—(i) energy efficiency; (ii) energy generation; (iii) land use; (iv) transport” and “when providing advice under subsection (1)(a), the advisory body may also express a view as to any other matter that body considers appropriate including, in particular, as to any sectors of the Scottish economy in which there are particular opportunities for contributions to be made towards meeting annual targets through reductions in emissions of greenhouse gases” (section 27(3-4)).</p> <p>Part 3 (sections 32-43): Reporting duties of Ministers to Parliament.</p> <p>Part 4 (sections 43-52): Duty of public bodies to contribute towards the targets.</p> <p>Part 5 chapter 1 (sections 53-56): duty of Ministers to present a climate change programme outlining relevant policies.</p> <p>Part 5 chapter 2 (sections 57-59): commitment to lay a land use strategy before parliament, to be reviewed every 5 years. “The strategy must, in particular, set out—(a) the Scottish Ministers’ objectives in relation to sustainable land use; (b) their proposals and policies for meeting those objectives; and (c) the</p>
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		timescales over which those proposals and policies are expected to take effect” (section 57(2), see relevant policy table). Ministers “may, by order, modify the functions of the Forestry Commissioners in or as regards Scotland” to meet the objectives set in the strategy (section 59).
<p>Scotland’s climate change adaptation framework (2009) NOW OBSOLETE, INCLUDED FOR REFERENCE</p> <p>* Followed by Sector Action Plans (Agriculture, Biodiversity and Ecosystem Resilience, The Built Environment, Business and Industry, Emergency and Rescue Services, Energy, Forests and Forestry, Health and Wellbeing, Marine and Fisheries, Spatial Planning and Land Use, Transport, Water Environment and Resource)</p>	<p>Explicit reference to “natural environmental assets, such as soil and water quality, that underpin vital ecosystem services essential to many sectors” (p.9).</p> <p>“Integrate adaptation into Scottish public policy” (p. 22): “In taking forward Sector Action Plans, the Scottish Government will continue to work with stakeholders to identify and address barriers to adaptation in Scottish policy. For example, an important element of the approach to integrating adaptation is the consideration of ecosystem services across the broad span of public policy. “Ecosystem services” is a description of the range of benefits that our society and economy enjoy from nature, including resources such as food and timber, protection such as flood management, and cultural services such as recreation. By including a consideration of the impact on ecosystem services in policy making, including the likely impact of climate change on the levels of ecosystem services and the biodiversity that underpins them, we can ensure that we protect the level of benefits that society enjoys from nature. Such an ‘ecosystem approach’ will be relevant to many of the sectors considered under the Adaptation Framework, with the leading consideration of ecosystem resilience in the face of climate change considered within the Biodiversity Sector Summary”. This section clearly seeks to give a comprehensive – although evasive – view of ES. Slight confusion with the use of the “ecosystem approach” concept.</p>	<p>Framework mainly designed as a statement of intent/ set of guidelines. Yet illustrates efforts towards inter-sector coordination and integration (pp. 13, 15, 21-22).</p>
<p>The Carbon Accounting Scheme (Scotland) Regulations 2010 (amended 2015)</p>	<p>No specific integration.</p>	<p>Regulation 4: definition of carbon units. “A carbon unit for the purposes of the Climate Change (Scotland) Act 2009 is a unit of the following kind: (a) assigned amount unit; (b) European Union</p>

		allowance; (c) certified emission reduction; and (d) emission reduction unit". This creates a link with certification schemes such as UKWAS. Regulations 5-7: provision regarding the organisation of an accounting scheme with unit transfers.
UK 2012 Climate Change Risk Assessment – Scotland (summary)	No explicit reference, apart from a mention to the provision of goods by marine ecosystems. Some of the risks presented are the result of changes in ecosystem functioning, yet this mediation between climate and society is not phrased out.	N/A
The Forestry Commissioners (Climate Change Functions) (Scotland) Order 2012	No explicit reference to NC/ES, but implicitly recognises the role of forest ecosystem in capturing carbon.	Extension of the Forestry Commissioners duties in Scotland to include "the delivery of climate change targets".
Low carbon Scotland. Meeting the emissions reduction targets 2013-2027: The second report on proposals and policies ('RPP2', 2013)	NC/ES not explicitly mentioned and text somewhat uneven in displaying an implicit understanding. Rural land use section (pp. 207-229) proposes an integrated vision covering "agriculture and related land use, peatland restoration and forestry. Emissions in these sectors come from livestock, agricultural soils, animal wastes and certain land use changes. Importantly, some biological processes also have the capacity to absorb carbon dioxide from the atmosphere and store carbon in soils and vegetation" (p. 208). Detailed account of the contributions from specific ecosystems, namely peatlands (pp. 216, 222, 229) and marine ecosystems (pp. 224-226) cited for their benefits in terms of carbon sequestration, biodiversity resources and flood control. But understanding of the ES notion not fully consistent throughout the document as ecosystems are sometimes described as the beneficiaries of these services: "restored peatland has many benefits for our ecosystems, including improved biodiversity and natural flood management" (p. 14). The document promote a rather 'passive' conception of "environmental benefits" connected to environmental protection, and yet its effects are valued: "Environmental benefits are estimated to be in the region of £1.4 billion	Energy section (pp. 91-169): refers to biomass, among other sources, mostly in terms of targets in the energy mix; See relevant table for policy content on the subject. Rural land use section (pp. 207-229): relate to various actions and policies in agriculture, planning and forestry. See related tables for relevant analysis.

	(net present value) following full implementation of the Waste (Scotland) Regulations 2012. Most of these environmental benefits are attributed to reduced global carbon emissions” (p. 203).	
Climate Ready Scotland: Scottish Climate Change Adaptation Programme (2014)	<p>Explicit reference to NC/ES and comprehensive definition despite limited use. Section 2, second chapter, “Climate Ready Natural Environment” (pp. 40-63): covers “biodiversity and ecosystem services – Scotland’s habitats and species and the goods and services provided by its plants, soils, rivers and lochs and other natural capital; the health of the seas around Scotland and the species that live in them; the role of land management and marine planning in protecting and enhancing habitats and biodiversity; the productivity of our land and seas and what this means for Scotland’s land-based and fishing industries”. Clear links between ecosystem function and provisioning/cultural services, as well as biodiversity. The programme seeks to be comprehensive with regards to the ways in which climate-triggered ecosystem function changes may affect human welfare: “the Programme is structured around an overarching aim and three themes. There will inevitably be interactions between each theme and they should not be viewed in isolation. For example, the health and productivity of ecosystems underpins agriculture which is essential for livelihood and food security. Reducing vulnerability and building resilience in the natural environment will therefore help to reduce vulnerability and build resilience for society” (p. 7).</p> <p>Yet the other two ‘themes’, “Climate Ready Buildings and Infrastructure” and more significantly “Climate Ready Society” (pp. 84-100) do not refer to ecosystem services. In the latter, the potential effects of climate change on communities are not presented in connection with ecosystem functioning and the mediation it operates. As a result showcased policy does no build on our knowledge of ecosystem services.</p>	The Programme has been designed as a statement of intent/ set of guidelines. Yet the policy overview it offers illustrates efforts towards inter-sector coordination and integration (planning, conservation, agricultural, fishing, forestry, land use and research policies, pp. 45-63).
Projections of emissions and removals from the LULUCF sector to 2050 (2013, compared to the 2012 version)	No specific reference to ES/NC or related concepts beyond carbon sequestration and storage.	Accounting of carbon sinks including forest lands, grasslands, wetlands and settlements (wetland not included in the 2012 version).

G.3. Policy assessment

Conceptual integration: Explicit and comprehensive but only in relation to adaptation since 2014 with the publication of the Scottish Climate Change Adaptation Programme. The integration of these notions has been gradual, as shown by evidence of an implicit understanding in the 2009 adaptation framework. None of the documents formulating the Scottish mitigation policy mention ES/NC concepts, and they generally display a narrow understanding of carbon sequestration. However the RPP2 contain significant progress towards a more comprehensive recognition of the carbon sink role played by all ecosystems, including marine habitats. In this regards Scottish authorities' awareness of the role of wetlands due to the importance of peatlands in Scotland is worth mentioning (see the soil and water sections above).

Operational integration: Explicit but not comprehensive. The NAEI, acting as a UK-wide decision-support instrument, goes beyond the minimum requirements of the European LULUCF by accounting for wetland carbon sequestration. Yet marine and coastal ecosystems are still absent from the report. Even if they introduce few concrete measures themselves, Scottish adaptation strategies and framework articulate an integrated vision that brings together policies acting directly on ES/NC from other policy sectors.

H: Bioenergy

H.1. Policy documents reviewed

Department of Energy & Climate Change (2011) *Planning our electric future: a White Paper for secure, affordable and low-carbon electricity*. Report, London: The Stationery Office, July.

——— (2012) *Electricity Market Reform: policy overview*. Report, London: The Stationery Office, November.

——— (2014) *Timber Standards for Heat and Electricity*. London: The Stationery Office.

Great Britain (2004) *Energy Act 2004*. Elizabeth II, Chapter 20 (2004). London: The Stationery Office.

——— (2007) *Renewable Transport Fuel Obligations Order 2007*. Elizabeth II, 2007 No. 3072. London: The Stationery Office.

——— (2008) *Energy Act 2008*. Elizabeth II, Chapter 32 (2008). London: The Stationery Office.

——— (2011) *The Renewable Heat Incentive Scheme Regulations 2011*. Elizabeth II, 2011 No. 2860. London: The Stationery Office.

——— (2013) *Energy Act 2013*. Elizabeth II, Chapter 32 (2013). London: The Stationery Office.

——— (2014) *The Renewables Obligation Closure Order 2014*. Elizabeth II, 2014 No. 2388. London: The Stationery Office.

Office of Gas and Electricity Markets (2011a) *Renewables Obligation: Sustainability Criteria for Solid and Gaseous Biomass for Generators (greater than 50 kilowatts)*. London: Office of Gas and Electricity Markets, 28 September.

——— (2011b) Renewables Obligation: Sustainability Criteria for Bioliquids. London: Office of Gas and Electricity Markets, 19 December.

——— (2014) Renewables Obligation: Sustainability Criteria Guidance. London: Office of Gas and Electricity Markets.

Scotland (2009) *Renewables Obligation (Scotland) Order 2009*. Elizabeth II, 2009 No. 140. London: The Stationery Office.

Scottish Executive (2007b) Biomass Action Plan for Scotland. Edinburgh, March.

Scottish Government (2009g) Renewables Action Plan. Edinburgh, June.

——— (2009h) Renewable Heat Action Plan for Scotland. Edinburgh, November.

———(2011e) 2020 Routemap for Renewable Energy in Scotland. Edinburgh, August.

H.2. Content analysis: summary table

Document	Conceptual integration	Operational integration
Biomass Action Plan for Scotland (2007)	Implicitly takes ES/NC into account as consideration is given to environmental impacts (pp. 51-55), including biodiversity conservation in relation to forestry and energy crop agriculture (p. 52).	Puts forward a strategy outlined in “ Annex A – Framework for action ” (pp. 59-62). Coordination across policy sectors, including climate change, agriculture and forestry. Linked to the UK Renewables Obligation.
Energy Act 2004; Renewable Transport Fuel Obligations Order 2007 (amended 2009, 2011, 2013, 2015); Energy Act 2008; Renewables Obligation (Scotland) Order 2009 (amended 2011, 2014)	No specific reference beyond the implicit role of climate change mitigation in preventing negative impacts on ecosystems.	2004 Act: Chapters 4 and 5 (sections 115-132) introduce the Renewables Obligation scheme for fuel and electricity generation. Providers must make provision to source a determined share of energy/fuel from renewable sources including biomass. Renewable Obligation Certificates (ROCs) must be presented to the relevant

		<p>Administrators (Ofgem and the Department for Transport) for verifications. Providers not meeting the target must buy out the scheme.</p> <p>The 2007 RTFO Order implements Chapter 5 of the Act.</p> <p>The Energy Act 2008 updates its 2004 counterpart.</p> <p>The 2009 Order enforces the renewables obligation scheme outlined in the 2008 Act.</p>
Renewables Action Plan (2009)	Implicit consideration through the attention given to environmental impacts of biomass production, in addition to the climate change mitigation objective of the policy.	Sectoral Routemap plan for Bioenergy presented in Annex (pp. 64-68): provision of information and advice, R&D towards next generation bioenergy, including advanced conversion technologies, promotion of transparency in the market, parallel regulation to control activity (e.g. air quality standards).
Renewable Heat Action Plan for Scotland (2009, updated 2010, 2011)	Same as above.	Section 6 (pp. 24-25): Environmental impact mitigation measures (air quality, biodiversity, water, soils, land use change). Section 7 (pp. 26-28): list of coordinated actions (best practice promotion, quality and sustainability control, targeted investment).
The Renewable Heat Incentive Scheme Regulations 2011 (amended 2013, 2104, 2015)	No specific reference beyond the implicit role of climate change mitigation in preventing negative impacts on ecosystems.	Incentive grant for the installation of heating installation meeting the criteria set out by Ofgem, the authority in charge of administrating the scheme.
2020 Routemap for	Same as above.	Almost no integration of

<p>Renewable Energy in Scotland (2011)</p>		<p>environmental impact control measures apart from a brief mention to SEAs (p. 14).</p> <p>Updated Sectoral Routemaps:</p> <p>Bioenergy (p. 25): “Forest management and harvesting in Scotland must comply with the UK forestry standard and associated guidelines. Scottish Government is working with UK government to introduce sustainability criteria for Biomass plants”.</p>
<p>Planning our electric future: a White Paper for secure, affordable and low-carbon electricity (2011); Electricity Market Reform: policy overview (2012); Energy Act 2013; The Renewables Obligation Closure Order 2014</p>	<p>No specific reference beyond the implicit role of climate change mitigation in preventing negative impacts on ecosystems.</p>	<p>Part 2 of the Act (sections 5-66): replacement of the Renewables Obligation scheme by the signature of Contracts for Difference for sustainable energy sources (CfDs). Under a CfD, energy suppliers are guaranteed a strike retail price corresponding to their investments. Should market prices fail to meet the strike price, the contract counterparty pays the difference. Conversely, if market prices exceed the strike price, energy suppliers must transfer marginal profits to the counterparty (Policy overview: 14-15). This new scheme includes energy derived from biomass.</p> <p>Chapter 7 (sections 55-56) of the 2013 Act and the 2014 Order make provision for the end of the Renewables Obligations scheme. The Government has pledged it will “continue to apply sustainability</p>

		standards to biomass and bioliquids under the new support framework” (White Paper: 55; policy overview: 22-23)
Renewables Obligation: Sustainability Criteria (2014, based on 2011 consultations); Timber Standards for Heat and Electricity (2014)	Implicit use of ES/NC knowledge in the presentation of proactive land management practices.	In addition to GHG emission balance (pp. 35-57), the 2014 Sustainability Criteria include land and woodland management criteria to prevent negative impacts from biomass production (pp. 23-27, detailed in the 2014 Timber Standards) (pp. 79-80, 100). There are however no criteria for air quality preservation.

H.3. Policy assessment

Conceptual integration: Implicit but showing command of the concepts and incomprehensive. British and Scottish policy does not refer directly to the notions of ES/NC, yet they build on the European Commission’s Renewable Energy Directive 2009/28/EC which does. Furthermore, these documents clearly reveal an understanding of the concepts and attempt to articulate them, despite a persistent emphasis on carbon sequestration against other services. The sustainability criteria for gaseous, liquid and solid biomass released by Ofgem in 2011 and used in Scotland focus on carbon accounting. However, compliance with the Directive entails considerations for the biodiversity and high carbon stocks of protected ecosystems. These documents also recognise the decontamination and soil restoration potential of agroecosystems (see below). A further step towards a more comprehensive approach was taken by both British and Scottish authorities in 2013-2014 with the adoption of sustainable energy forestry management standards, even though these criteria remain implicit and limited in their use of the ES/NC concepts (Timber Standards for Heat and Electricity, 2014).

Operational integration: Implicit moving towards explicit, incomprehensive. UK-wide and Scottish norms cover more ground than their European counterparts, notably with the existence of criteria for solid biomass, yet they are still heavily skewed towards GHG emissions. Policy instruments also remain mainly indirect as they aim at reducing the negative impacts of bioenergy production on ES/NC such as air quality, “biodiversity, landscape, cultural heritage, water and soils” (Renewable Heat Action Plan for Scotland, 2009: 24). Ofgem’s approach including a “bonus” for the restoration of degraded land in sustainability assessments offers nevertheless a broader, more proactive vision in which ecosystem functions are used to enhance natural capital (Ofgem, 2011a, 2011b, 2014).

I: Other policy documents

I.1 Horizontal policy

Scotland (2005) *Environmental Assessment (Scotland) Act 2005*. Elizabeth II. Asp 15 (2005). London: The Stationery Office.

Scottish Executive (2004b) *Scotland's Biodiversity: It's in Your Hands - A strategy for the conservation and enhancement of biodiversity in Scotland*. Edinburgh, May.

Scottish Government (2013b) *2020 Challenge for Scotland's Biodiversity*. Edinburgh, June.

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——— (2015c) *Scotland's Biodiversity - a route map to 2020*. Edinburgh: Scottish Government, June.

Scottish Natural Heritage (2012b) *Scotland's Natural Capital Asset (NCA) Index: 2012 version*. Report, Inverness.

——— (2015) *Scotland's Natural Capital Asset Index: 2015 version*. Report, Inverness.

I.2. European Policy

European Commission (2006) *Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - Thematic Strategy for Soil Protection*. COM(2006) 231, Brussels.

——— (2006b) *Proposal for a Directive of the European Parliament and of the Council establishing a framework for the protection of soil and amending Directive 2004/35/EC*. COM(2006) 232, Brussels.

- (2012a) Ex-post evaluation of the EU Forest Action Plan: Executive summary. Brussels.
- (2012b) Ex-post evaluation of the EU Forest Action Plan. Brussels.
- (2012c) Report from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions: The implementation of the Soil Thematic Strategy and ongoing activities. COM(2012) 46, Brussels.
- (2013b) Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions: An EU Strategy on adaptation to climate change. COM(2013) 216, Brussels.
- (2013c) Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions: A Clean Air Programme for Europe. COM(2013) 918, Brussels.
- European Council (1992) *Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora*. Brussels.
- European Parliament and European Council (2000) *Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy*. Brussels.
- (2007) *Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks*. Brussels.
- (2009a) *Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Text with EEA relevance)*. Brussels.

——— (2009b) *Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020*. Brussels.

——— (2009c) *Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds*. Brussels.

I.3. Land Use Strategy regional pilots

Aberdeenshire Council (2015b) *Land Use Change Issues and Opportunities for Aberdeenshire: Overview report*. Report, Inverurie, January.

——— (2015c) *SEA Post-adoption statement for the Aberdeenshire Land Use Strategy Pilot*. Inverurie, 24 March.

Davidson J, Birnie, I, Irvine R, et al. (2015) *Aberdeenshire Land Use Strategy Pilot Final Report*. Report for Aberdeenshire Council, Inverurie, March.

Robeson, D (2014) *Scottish Borders Land Use Strategy Pilot: Interim Consultation Document Key Points Summary - August 2014*. Report for Scottish Borders Council, Melrose, August.