

## **General Biodiversity Impact Assessment in Strategic Environmental Assessment: Addressing a neglected area**

*John Fry<sup>1</sup>, Tamara Hochstrasser<sup>2</sup>, Ainhoa González<sup>3</sup>, Jackie Whelan<sup>2</sup>, Paul Scott<sup>4</sup>, Peter Carvill<sup>1/5</sup>, Mike Jones<sup>3</sup>*

<sup>1</sup>*School of Agriculture & Food Science, University College Dublin, Ireland*

<sup>2</sup>*School of Biology & Environmental Science, University College Dublin, Ireland*

<sup>3</sup>*School of Natural Sciences, Trinity College Dublin, Ireland*

<sup>4</sup>*ScottCawley Ltd, Dublin, Ireland*

<sup>5</sup>*National Parks and Wildlife Service, DoEHLG, Ireland*

### **Abstract**

Unlike the EIA Directive, the EU's SEA Directive makes specific reference to addressing impacts on 'biodiversity' in addition to those on 'flora' and 'fauna'. In doing this, the primary focus is usually on the *in-situ* or (increasingly) *ex-situ* assessment of priority species and/or habitats that are also subject to Appropriate Assessment (AA) under the Habitats Directive (CEC, 1992). AA provides a stronger protection imperative than SEA (or EIA) since impact avoidance is generally the only allowable mitigation. Furthermore, the AA emphasis on rare and often specialist elements is at odds with the need to sustain the more general biodiversity that constitutes the majority of the natural system, and which is being eroded by cumulative effects from multiple developments. There is evidence throughout Europe of loss of landscapes and their distinctive associated habitats - especially due to changes in rural management practices resulting from cumulative socio-economic pressures - including EU support schemes that are not themselves subject to SEA, are often applied inconsistently and seem insufficiently targeted towards sustainability.

SEA is usually regarded as a good model for addressing cumulative effects on some Valued Environmental/Ecosystem Components (VECs), and this is its major strength during application of the EU Water Framework Directive. Unfortunately, while 'general biodiversity' is a valuable component of any concept of the environment, it is too amorphous to be treated as a single coherent VEC. Attempts to address such issues through the identification of 'ecosystem services' during SEA have limitations for developed countries where there is little obvious economic exploitation of semi-natural biodiversity and few clear indicators of changes in it. Furthermore, 'services' invokes financial 'costs', a concept that may prove controversial in the current economic climate and provoke unhelpful argument over trade-offs. This paper argues that sustaining general biodiversity demands an assessment procedure that will address and support managed change in a broader socio-ecological context and in a comparatively silent manner.

### **Introduction**

In 2010, the Irish Environmental Protection Agency (EPA) awarded a *STRIVE* contract for the development of an Integrated Biodiversity Impact Assessment (IBIA) procedure. This primarily envisaged development of a mechanism for integrating Appropriate Assessment (AA) under the Birds and Habitats Directives (CEC, 1979, 1992) with the assessment of biodiversity-related topics considered under SEA and EIA procedures. It was envisaged that IBIA would streamline planning procedures and facilitate a 'one-stop-shop' for assessment and consent processes - and the first steps in establishing this were outlined in papers presented at IAIA11 (Fry et al, 2011 a/b; González and Fry, 2011; González et al, 2011a) and

elsewhere at this meeting (González et al, 2011b). However, the term 'IBIA' also suggests the possible integrated assessment of impacts on all types of biodiversity - whether or not the actions causing them qualify for SEA or EIA, and whether or not that biodiversity constitutes the EU's *Natura 2000* species/habitats that are subject to AA.

All the EU's institutionalised assessment procedures are deficient in respect to general biodiversity. The Convention on Biodiversity (CBD) emerged from the 1992 Rio Conference, after which 'biodiversity' gained currency as a stock-phrase. Given this chronology, it is not surprising that the EU EIA Directive 85/337/EEC made no specific reference to *biodiversity*, merely calling, in its most closely related provision, for the assessment of impacts on 'flora' and fauna' (CEC, 1985). Even though the Directive was amended post-Rio in 1997, the term biodiversity was not added to its provisions, although the new Annex III did place greater screening emphasis on sensitive habitats (CEC, 1997). Similarly, several years after the CBD, the EU's Directive 2001/42/EC (CEC, 2001) did much to raise the worldwide profile of SEA. Once again, chronology explains why SEA does not get much mention in the CBD (Slootweg et al, 2010). The SEA Directive does include the concept of biodiversity, but still retains the 'flora' and fauna' of the EIA directive - arguably indicating that the Commission meant 'biodiversity' to be construed as more than concern for individual species. Slootweg et al (2010) agree, arguing against the 'fortress conservation' approach, and stating that 'nature conservation' is a narrow definition of biodiversity and that assessment cannot be limited to looking at protected areas/species.

Not all actions potentially damaging biodiversity are caught by EIA, simply because they do not derive from 'projects' subject to consent procedures. Furthermore, project-level assessment is notorious for not being able to catch the cumulative effects of otherwise tolerable minimal impacts - certain background impacts, such as the extensive effects of agricultural practice, e.g. slurry-spreading, are disregarded. SEA can address this, but that requires the actions of concern to be formulated within a policy, plan or programme so as to provide a necessary assessment framework - and policy assessment is only institutionalised in some EU jurisdictions. AA suffers from a limited focus on endangered, usually narrowly-specialist, and frequently localised species/habitats. In combination, the current assessment mechanisms provide poor support for *general* biodiversity, which only receives attention after damage is done and once fairly widespread species/habitats achieve 'threatened' status, when the prospects of recovery are likely to be poor, and the cost may be prohibitive. In September 2011 two further birds (the willow tit and the lesser spotted woodpecker) were added to the British Endangered List of species considered under threat from generalised rural practices that are not specifically subject to, and may be officially exempt from, control by current assessment procedures (BBC, 2011). Tightening the EIA definition of individual projects, as occurred recently with Irish Regulations covering on-farm developments (DAFF, 2011) can help, but there is already criticism that the new screening and mandatory thresholds exceed the size of some crucial land-holdings. This paper investigates the capacity of the existing assessment framework (and particularly SEA) to address impacts on general biodiversity before crises arise, as well as the potential for an Integrated Biodiversity Impact Statement (IBIS) to flexibly address the needs of multiple legislative imperatives.

### **The conceptual spread of a definition of biodiversity**

From a policy perspective, several aspects of biodiversity conservation have been or are being operationalised under a variety of environmental legislation (Figure 1). However, as has been argued elsewhere in relation to concern about 'landscape' (Whelan et al., *in press*), this does

not mean that there is coherence in either the approach or the definitions being employed, nor that this legislation is, collectively, comprehensive in identifying and addressing the full range of threats to biodiversity. Biodiversity, as defined by the 1992 Convention on Biological Diversity (CBD), incorporates many dynamically different components of the environment, ranging from species through communities to habitats, and encompassing variability in numbers of individuals and species, and genetic variability within population of varying sizes. Such an all-embracing definition often generates conflicting conservation objectives that defy assessment in a coherent fashion - even within a single administrative region - and seriously limit the application of a universal approach over wide geographic areas. Furthermore, it can hardly be expected that there would be full (or even sufficient) scientific knowledge available to grasp the dynamic relationship within the socio-ecological system and thus make a scientifically sound assessment of impacts in the time available for any assessment.

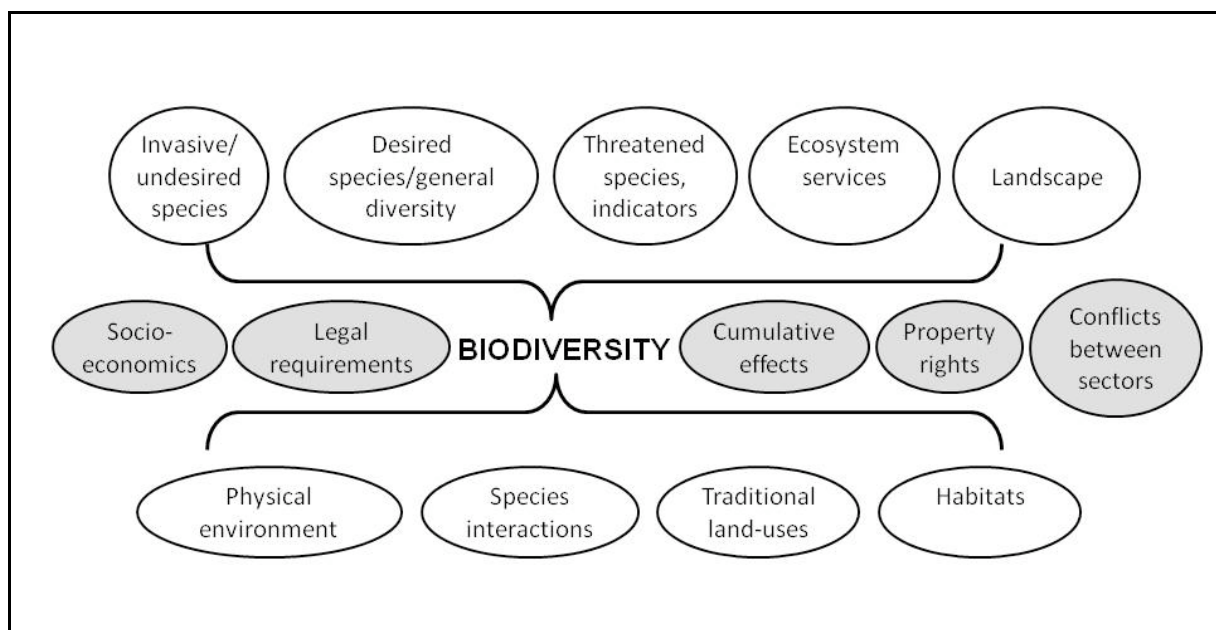


Figure 1: Components of biodiversity as they are valued by society (top line) and elements of the environment necessary to maintain biodiversity (bottom line). The desirability of biodiversity is weighed against the factors in shaded ellipses during the assessment process.

### The Ecosystem Services approach

Cumulative Effects Assessment (CEA) has taken a different approach that focuses on individual *Valued Environmental/Ecosystem Components (VECs)*, e.g. water quality within a single catchment, and looking outward to identify all activities that could impact on that (Canter and Ross, 2010). The CEA approach is increasingly infiltrating older established procedures and shifting emphasis in SEA to consideration of valued Ecosystems Services (ESs). This new paradigm has been advocated as an effective tool for addressing biodiversity assessment, one that incorporates the human perspective and sustainable or equitable use of biodiversity rather than a species-based and protection-oriented approach (Slootweg et al, 2010). It is a positive development, and the case study examples are convincing but operate in a developing world scenario that effectively advocates defeating the 'tragedy of the commons' through recognition of enlightened self-interest in the controlled communal exploitation of environmental assets.

It can be argued that ES-SEA is of more limited value in a developed world context, and especially in western Europe where there are few opportunities for individuals to exploit the residual environmental commonwealth. Water, or more specifically, the water cycle, can certainly be argued to be an ES, and ES-SEA has a definite role in relation to catchment management - as, for example, under the EU's Water Framework Directive (CEC, 2000). However, in developed 'northern' countries, direct exploitation of biodiversity has been historically consigned to a specific landholders (e.g. farmers) and citizen access to rural assets is discretionary at best. The extensive system of 'private' land ownership means that farming and forestry cannot be regarded as ESs in the same way as in developing countries, since their output is dedicated to individuals or corporations and, as such, these ecosystem services are not available for further distribution. Forests, far from being resources amenable to mixed-use exploitation, are single-focus production systems in which 'sustainable forestry' still tends to refer to maintaining timber output. In Ireland, apart from water, the two most important VESs supplied by biodiversity are probably pollination and biological pest-control - both of which broadly depend upon general biodiversity rather than individual species or habitats. The worldwide importance of the latter was highlighted in China during the 'Great Leap Forward' by the unfortunate contribution that the 'kill a (grain-eating) sparrow' campaign made to the subsequent man-made famine.

Long-established agricultural practice created landscapes that initially offered opportunities for increased biodiversity (Feehan, 2003), but eventually stabilised as a sea of anthropogenic management containing islands of semi-natural biodiversity. Ironically, some areas of compromised biodiversity in cultural landscapes are of significant ecological interest, but their survival depends on the maintenance of what are now outmoded management practices (Krzywinski et al, 2009). Once again, these essential maintenance activities lack legal reinforcement since they fall outside of the normal assessment framework, doubly so since proposals for positive intervention into landscape-scale activities have tended to be exempt from SEA (Whelan and Fry, 2011). That happened, for example, with the Irish Government's avoidance of SEA for its now-closed Rural Environmental Protection Scheme - REPS (Bell, 1996; Emerson and Gillmor, 1999) that had been launched in response to the EU's agri-environmental Regulation 2078 (EEC, 1992; DGVI, 1998). Indeed, the expenditure on REPS was initially justified on a monetary basis (farmer uptake and levels of payment), and the promised biodiversity and landscape benefits had to be retrospectively validated (Feehan et al, 2002; Whelan et al, *in press*). This is not a specifically Irish problem, elsewhere in Europe, there is evidence of a similar lack of effectiveness in the (general) biodiversity aspects of agri-environmental schemes (DGVI, 1998; Kleijn et al, 2001; Berendse et al, 2004). A fundamental and unresolved tension has arisen between the demand to increase agricultural productivity and profitability and the retention of a biodiverse landscape.

### **Biodiversity in Ireland's island context**

While Ireland is an island whose territory encompasses two legal jurisdictions, the environmental concerns of both are framed by essentially common history and the same over-arching EU legislation. Islands have long been of intellectual interest in the study of biodiversity, both in relation to their initial colonisation and the development of endemic species or varieties, and in the threats subsequently exposed to their flora and fauna by introduced or invasive species (Macarthur and Wilson, 1967). Worldwide, naturalisation exceeds extinctions on all islands (Slootweg, 2010), which makes it superficially easy to achieve the 'conservation and no net biodiversity loss' objective set by IAIA (2005). The

reality in an island situation is that two of the CBD's core concerns (number of species and genetic diversity within species) are actually counter-productive, and efforts are targeted on minimising loss of 'natives' and containing the spread of 'invasives'. It is difficult to apply current impact assessment procedures to invasive species, which may in any case be migrating in response to climate change or non-anthropogenic stimuli. However, regulatory procedures usually exist for the control of some aspects of invasion, and these could be standardised and their biodiversity link re-emphasised to a large extent within IBIA. The proposed *Integrated Biodiversity Impact Statement (IBIS)* could also be used to summarise the information needed to address legal controls over:

- deliberate introduction and dispersal of species of potential commercial or ornamental use,
- trade in pets that may escape, or be released into the wild when owners tire of them (e.g. Siberian chipmunks),
- deliberate introduction of biological control agents of pre-existing invasive species,
- quarantine of materials that might be biologically contaminated,
- introduction of genetically modified organisms (GMOs).

As in other areas, the assessment of such activities may be of regulatory interest to more than one authority and it is, therefore, necessary to establish integrated administrative procedures under which one decision can concurrently fulfil the requirements of each process. Introduced species are covered in new Irish Wildlife Regulations currently under review (DEHLG, 2010) and which have been drafted to entertain the general possibility of collective inter-agency decision-making.

## **Operational VECs**

However, it must also be recognised that different agencies can also have conflicting policies that will need to be rationalised. This reflects the argument (Slootweg et al, 2010) that the CBD is a framework advocating a holistic approach and setting out rights and responsibilities rather than targets or lists of species - IBIA should follow suit. Furthermore, in order to make a meaningful approach to the concept of biodiversity in an assessment context, we argue that the concept has to be changed into an *Operational VEC*.

An Irish example would be the cultural landscape of the Burren in north County Clare, a limestone pavement of species-rich grasslands that is of significant botanical interest (UNESCO, 2010). The Burren's obvious VEC (the maintenance of which is required by European legislation) is the species-rich grassland created by now outmoded farming practices that included unusual upland winterage (Dunford, 2002; O'Rourke, 2005; Dunford, 2009). Unfortunately, the problem was worsened by two factors; 1) Ireland's agri-environmental REPS laid down generalised provisions that were actually counter-productive in the localised context of the Burren, and 2) the contributory invasive threat of hazel scrub, which is itself an EU conservation priority. The transitory BurrenLife project (BurrenLife 2010 a,b) seems to have resolved the first issue by:

- 1) clearly demonstrating that VEC's anthropogenic origin,
- 2) gaining community-wide recognition of the economic benefit of maintaining the VEC (both in direct payments and as gains from tourism or added-value agricultural products),
- 3) developing a scientifically-validated ecological understanding of how the VEC could be maintained by new management practices; and using this to convince both farmers and administrators to change attitudes.

In this case, the community has been able to operationalise aspects of biodiversity; BurrenLife's research perspective being replaced by the practical *Burren Farming for Conservation Programme (BFCP)* sponsored by the Department of Agriculture (DAFF, 2010). The biodiversity VEC has integrated with other elements of rural heritage in the Burren area and contributed to resurrecting local pride in that heritage. The economic stability offered by the new farming prescriptions empowered the local community to manage their environment in a way compatible with this local heritage - but, on a higher level, they are contributing exactly to the aims of international legislation to protect biodiversity in a very distributed and ultimately low-cost fashion (Walsh, 2009).

The relationship between conservation needs and national or international legislation is not easy, and needs to be addressable within local contexts. In the Burren, the conflicting conservation interests of species-rich grassland and hazel scrub have yet to be resolved, as does the probability that the BFCP may become a victim of its own success by creating populations of Natura species that will trigger subsequent AA. In the case of *High-Nature-Value* farm areas in Germany, the definition of what constituted such an area was not standard, but varied on a regional basis with the result that approximately similar percentages of the landscape were so classified across the whole country. In northern Germany, 'species-rich' may mean 10 species/m<sup>2</sup> of roadside verge, whereas in southern Germany it means 20 species/m<sup>2</sup> (Fuchs and Benzler, 2011). It would be a loss to the northern population, and a greater loss to establishing the importance of VECs nationally, if the protection of northern verges were to be neglected because they do not correspond to a uniform national or international standard.

General biodiversity needs to be supported through a cumulative effects approach that addresses the small-scale actions of individual landholders. Such actions are, by definition, unlikely to have been generated by 'projects' subject to EIA, nor by development-inspired actions at the higher planning levels. In situations where EIA is involved, it may be appropriate to modify legislation so that planning authorities can demand biodiversity 'green-gain' that goes beyond standard mitigation as part of the overall project design. However, impacts on operational VECs would be amenable to moderation through better-targeted agri-environmental plans. The most appropriate regulatory mechanism for such farm-level actions would be the equivalent of an Environmental Management System (EMS) to implement a compulsory farm (biodiversity) management plan. Such a policy initiative will need to incorporate flexibility in recognising localised operational VECs involved and (especially in the current economic climate) will have to take account of the cost implications of protecting them. Identifying localised VECs will need to be an exercise in participatory landscape ecology (Luz, 2000) involving the local stakeholders so that cohesive community support can be generated for them.

This approach will, of course, need to be subject to thorough SEA to identify potential pitfalls and the best practical environmental options in the event that conflicting biodiversity interests are identified. However, this could address and support managed rural change in a broader socio-ecological context and in a comparatively silent manner.

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## References

- BBC, 2011. Willow tit and lesser spotted woodpecker on at-risk list. British Broadcasting Corporation: London. Accessed 12 September at: <http://www.bbc.co.uk/news/science-environment-14815987>
- Bell, P, 1996. Environmental Farming - Guide to the Rural Environmental Protection Scheme (REPS). Dublin: Philip Farrelly and Company.
- Berendse, F; D Chamberlain; D Kleijn and H Schekkerman, 2004. Declining biodiversity in agricultural landscapes and the effectiveness of agri-environmental schemes. *Ambio: a Journal of the Human Environment*, 33, 499-502.
- BurrenLife, 2010a. The BurrenLife Project: Final Report 2010 & Best Practice Guides 1-5. Carron, Co. Clare, Ireland: BurrenLife.
- BurrenLife, 2010b. Farming for conservation in the Burren. Carron, Co. Clare, Ireland: BurrenLife, website: <http://www.burrenlife.com>. Accessed: February 2010
- Canter, Larry and Bill Ross, 2010. State of practice of cumulative effects assessment and management: the good, the bad and the ugly. *Impact Assessment & Project Appraisal*, 28 (4) 261-8.
- CEC, 1979. Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds. *Commission of the European Communities. OJ L* 103 of 25.04.1979
- CEC, 1985. Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment. *Commission of the European Communities. OJ L* 175, 5.7.1985, 40-48.
- CEC, 1992. Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Luxembourg, *Commission of the European Communities. OJ*, L206, 22/7/1992, 7-50.
- CEC, 1997. Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. *Commission of the European Communities. OJ*, L 73, 14.3.1997, p. 5-15
- CEC, 2000. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Luxembourg, *Commission of the European Communities. OJ*, L327, 22/12/2000.
- CEC, 2001. Directive 2001/42/EC of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment. *Commission of the European Communities. OJ*, L197/30, 21/7/2001, 30-37.
- DAFF, 2010. Terms and conditions of the Burren Farming for Conservation Programme. Dublin: Department of Agriculture, Fisheries and Food. Available at: <http://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/otherfarmerssschemes/burrenfarmingforconservationprogramme/Burren%20Farming%20Con%20P%20terms%20and%20cond%20in%20PDF.pdf>
- DAFF, 2011. Ministers secure agreement on EIA Regulations for On-Farm Developments. Dublin: Department of Agriculture, Fisheries and Food; Press release. Accessed on 12 September at: [http://www.agriculture.gov.ie/press/pressreleases/2011/september/title\\_57866,en.html](http://www.agriculture.gov.ie/press/pressreleases/2011/september/title_57866,en.html)
- DEHLG, 2010. Draft Birds and Habitats Regulations 2010, published for public consultation. Dublin: Department of Environment, Heritage and Local Government.
- DGVI, 1998. State of Application of Regulation (EEC) No. 2078/92: Evaluation of Agri-Environment Programmes. Brussels: DGVI Commission Working Document VI/7655/98.
- Dunford, B, 2002. Farming and the Burren. Dublin: Teagasc.
- Dunford, B, 2009. Farming and the future of the Burren as a cultural landscape. In: Krzywinski, K., O'Connell, M. and Kuster, H. *Cultural Landscapes of Europe*. Bremen: Aschenbeck Media.
- EEC, 1992. Council Regulation (EEC) No. 2078/92 of 30 June 1992 on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside. Brussels. *Official Journal of the European Communities*. <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992R2078:EN:HTML> 683
- Emerson, J and D Gillmor, 1999. The Rural Environment Protection Scheme in the Republic of Ireland. *Land Use Policy* 16, 235-245.
- Feehan, J(ohn), 2003. Farming in Ireland: History, heritage and environment. Dublin: Faculty of Agriculture, University College Dublin
- Feehan, J(ane), DA Gillmor and NE Culleton, 2002. The impact of the Rural Environment Protection Scheme (REPS) on plant and insect diversity. *Tearmann: Irish Journal of agri-environmental research* 2, 15-28.
- Fry, J; P Carvill; B Grist and T Hochstasser, 2011a. Developing IBIA: Legal and Administrative Issues. Paper presented at IAIA11, the 31st Annual meeting of the International Association for Impact Assessment, Puebla, Mexico 29 May - 4 June 2011.

- Fry, J; T Hochstrasser; A González; P Scott; P Carvill, and H Shahumyan, 2011b. Developing IBIA: Process and content? Paper presented at IAIA11, the 31st Annual meeting of the International Association for Impact Assessment, Puebla, Mexico 29 May - 4 June 2011.
- Fuchs, D and A. Benzler, 2011. Identification and distribution of HNV farmland in Germany – Keynote address. In: D Ó hUallacháin and J Finn (eds.), *Conserving Farmland Biodiversity: Lessons learned and future prospects*, Proceedings of Teagasc Biodiversity conference, 25-26 May 2011, Wexford, Ireland. Available at: [http://www.teagasc.ie/publications/2011/996/Biodiversity\\_Conf\\_Proceedings.pdf](http://www.teagasc.ie/publications/2011/996/Biodiversity_Conf_Proceedings.pdf)
- González, A and J Fry, 2011. Developing IBIA: Data limitations on GIS support. Paper presented at IAIA11, the 31st Annual meeting of the International Association for Impact Assessment, Puebla, Mexico 29 May - 4 June 2011.
- González, A; J Fry; T Hochstrasser and H Shahumyan, 2011a. Developing IBIA: Review of GIS-compatible methods. Paper presented at IAIA11, the 31st Annual meeting of the International Association for Impact Assessment, Puebla, Mexico 29 May - 4 June 2011.
- González, A; J Fry; T Hochstrasser; P Scott; P Carvill and M Jones, 2011b. A Methodological Approach to Integrating Strategic Environmental Assessment and Biodiversity Impact Assessment. Paper presented at IAIA Special Meeting 'SEA Implementation and Practice: Making an Impact? 21-23 September 2011, Prague, Czech Republic.
- IAIA, 2005. Biodiversity Section: Principles on Biodiversity in Impact Assessment. Fargo, USA: International Association for Impact Assessment, Special Publications Series 3.
- Kleijn, D; F Berendse; R Smit and N. Gilissen, 2001. Agri-environment schemes do not effectively protect biodiversity in Dutch agricultural landscapes in the Netherlands. *Nature*, 413, 723-725.
- Krzywinski, K; M O'Connell and H Kuster, 2009. *Cultural Landscapes of Europe*. Bremen: Aschenbek Media.
- Luz, F, 2000. Participatory landscape ecology - A basis for acceptance and implementation. *Landscape and Urban Planning* 50, 157-166.
- MacArthur, R.H. and E.O. Wilson, 1967. *The theory of island biogeography*. USA: Princeton University Press.
- O'Rourke, E, 2005. Socio-natural interaction and landscape dynamics in the Burren, Ireland. *Landscape and Urban Planning*, 70, 69-83.
- Slootweg, R; A Rajanshi; V.B. Mathur and A Kolkoff, 2010. *Biodiversity in Environmental Assessment: Enhancing ecosystem services for human well-being*. UK: Cambridge University Press.
- UNESCO, 2010. World Heritage: Burren. UNESCO World Heritage website, available at: <http://whc.unesco.org/en/tentativelists/308>
- Walsh, K, 2009. *The voice on the ground, a survey of the needs of Burren farm families*. Kinvarra, Co. Galway: Burrenbeo Trust Limited (in association with the Burren Irish Farmers Association supported by the Heritage Council, Dunboyne).
- Whelan, J and J Fry, 2011. The *Lack* of SEA to support agri-environmental objectives in Ireland's Rural Environmental Protection Scheme. *J. Environmental Assessment Policy and Management*, 13 (1) 101-127
- Whelan, J., Fry, J. and Green, S. (*in press*). Landscape Protection under the Rural Environment Protection Scheme (REPS) in the Republic of Ireland: The evolution and future definition of a concept of rural landscape. *Tearmann: Irish Journal of agri-environmental research (in press)*.