HOUSES OF PARLIAMENT
PARLIAMENTARY OFFICE OF SCIENCE & TECHNOLOGY

POSTNOTE

Number 429 February 2013

Biodiversity & Planning Decisions

Built developments and mineral extraction can bring social benefits. However, if developments decrease biodiversity there could be a net loss of human well-being. Planning policy is devolved and this POSTnote sets out how the information on impacts of proposed developments on biodiversity is given to planners in England. It also summarises approaches to enhance biodiversity and avoid, mitigate and compensate for negative impacts.

Overview

- Biodiversity is declining in England.[1-4] Planning policy states that developments should not be permitted if they cause significant harm to biodiversity. A net gain in biodiversity should be provided if possible.[5]
- Current practice for assessing impacts of proposed developments on biodiversity and communicating this to planners is variable.[6]
- Many Local Authorities lack the capacity and expertise to examine the ecological content of planning applications and enforce planning conditions.[7-9]
- Inadequate monitoring and a lack of research are impeding improvements in predicting, avoiding and mitigating impacts,[10] and studies suggest existing processes are ineffective.[6,7,9]
- Opinion varies on the relative advantages and risks of using biodiversity offsetting as a method to compensate for biodiversity loss due to development in England.[11,12]

Biodiversity in England

Over the last 50 years large areas of important habitats have been destroyed in England,[1] with many remaining areas fragmented and in poor condition.[2] This has resulted in serious declines in a wide range of species and losses from England, such as of the Great yellow bumblebee.[3,4] Biodiversity is the abundance and variety of species and their physical habitats (Box 1).[13] Biodiversity has intrinsic value and humans also rely on it for economic resources and well-being (POSTnote 281).[14-17] The decline in such benefits has been highlighted by the UK National Ecosystem Assessment, who note that biodiversity is frequently undervalued in decisions about land use.[15]

Government considers that economic growth and protecting the natural environment are compatible and aims to halt biodiversity loss by 2020.[18,19] It also intends to increase the number, size, quality and connectedness of wildlife sites.[2,18,19] England's current protected sites do not form the coherent ecological network needed to stop net biodiversity loss (POSTnote 300).[2] A new body – the Natural Capital Committee – will report in early 2013 on how and where England's natural assets are being used unsustainably.[20]

Biodiversity and Planning Policy

The National Planning Policy Framework streamlines existing policy.[5] It states that "if significant harm resulting from a development cannot be avoided[…], adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused". However, there are widespread concerns about potential impacts of the draft Growth and Infrastructure Bill on biodiversity.[21,22] Commons Library Note "Planning Reform Proposals" has further information on major reforms to the planning system, including for Nationally Significant Infrastructure Projects.[23]

Box 1. Habitats and Biodiversity Loss

Some habitats, such as chalk grassland, are more important for England's biodiversity than others. This is because they are rare habitats and also support a high number of species or endangered specialists. Certain 'brownfield' sites, for example, are important for invertebrates and are more biodiverse than some 'greenfield' sites. Biodiversity is being lost from a variety of areas, including farmland and priority habitats (Box 2).[2,24] These unprotected areas are important because England's protected sites on their own are too small and isolated to stop net biodiversity loss.[2]

The Mitigation Hierarchy

The mitigation hierarchy aims to prevent net biodiversity loss and is included in planning policy and ecological best practice guidelines.[5,25] Definitions vary, but usually include the following steps that must be implemented in order:[25,26]

- Anticipated biodiversity losses should first be **avoided** and **reduced** by using alternative sites and designs.
- Impacts considered unavoidable should be **mitigated** where the impact occurs if possible. For example, bat roosts or ponds that are destroyed should be replaced.
- Any residual significant biodiversity loss is caused by remaining impacts after avoidance and mitigation. This should be **compensated** for. Where possible this is done by creating the same habitat type off-site.

It is desirable to aim for a net biodiversity gain by using **enhancement** measures, such as by providing more habitat than needed for mitigation and compensation.[5,25,26]

Legal protection of Biodiversity

Developers and planners need to consider wildlife and conservation law (Box 2) and whether a protected species licence is needed (Box 3). The Biodiversity Duty in the Natural Environment and Rural Communities Act 2006 states that every Public Authority must have regard to the conservation of biodiversity. Some specified types of large development projects are required to comply with the European Union Environmental Impact Assessment (EIA) Directive.[27] This requires assessment of the effects of a proposed project on the environment and public consultation before a decision is made. Other developments may need an EIA if they could affect protected areas or meet certain thresholds. Following consolidation, the Directive is being revised.[28-30] The Government will be consulting in 2013 on raising the threshold for when Local Authorities have to consider if EIA is needed.[31] This could result in fewer EIAs.

Box 2. English and Welsh Widlife and Conservation Legislation

- The EU Habitats Directive and the EU Wild Birds Directive protect various species and are implemented by a number of UK statutory instruments. Developments affecting European Protected Species will require a licence (Box 3).
- Special Areas of Conservation and Special Protection Areas are designated by member states for listed habitats and species. Proposed developments that might affect the integrity of these sites will need a separate process of 'Appropriate Assessment'. If there are adverse impacts, plans can only proceed if there is no alternative, there are imperative reasons of over-riding public interest and compensation is provided for residual net loss.
- The Wildlife and Countryside Act 1981 identifies Nationally Protected Species. The level of protection for these varies.[32]
- Sites of Special Scientific Interest are a sample of England's important biological or geological sites. National Nature Reserves are a selection of the most valuable of these sites. Local Nature Reserves are managed for biodiversity at a regional or local level.
- The Natural Environment and Rural Communities Act 2006 lists 'Priority Species' and 'Priority Habitats' of principal importance for conserving biodiversity. The Environment Secretary of State is required to further their conservation, but they do not automatically receive legal protection.
- Local Wildlife Sites and Ancient Woodlands are designated for high biodiversity value, but accord a lesser level of protection than the designations listed above.

The Law Commission will make recommendations in 2014 on consolidating aspects of the law relating to species into one statute.[33]

Box 3. Protected Species Licenses

After obtaining planning permission, the developer may need to apply to Natural England for various types of licence regarding protected species before work starts on site.[34] For example, licenses for developments that will kill, injure or disturb a European Protected Species or damage a breeding site or resting place can be granted if there is an overriding public interest and no satisfactory alternative.[27] The European Protected Species for which the licence is granted has to be maintained at a 'favourable conservation status'.[27]

Measuring Impacts on Biodiversity

An Environmental Impact Assessment usually includes an Ecological Impact Assessment (EcIA). EcIA identifies, quantifies and evaluates the impacts on biodiversity of a proposed development (Box 4).[25,26] Most EcIAs are paid for by the developer and carried out by ecologists employed by consultancies. There is often input from the Local Authority, Natural England, the Environment Agency and other groups. The EcIA report forms part of the developer's planning application. The Local Authority can include the avoidance, mitigation and compensation measures recommended in the EcIA report as planning conditions and obligations.

Issues with Current Planning Policy

Some have concerns that environmental regulations are preventing development.[35] However, a recent Government review of the implemention of the relevant EU Directives (Box 2) found no evidence for this.[36,37] Less than 0.5% of the land use consultations that Natural England receives are objected to because of these regulations.[36] A study of Local Authorities concluded that developers were not required to provide excessive ecological information in planning applications.[9] However, obtaining protected species licences can be slow and complicated, so Government is streamlining this process.[38] There are also concerns about the cost to householders of species surveys and licenses.

An absence of systematic recording means that there is a lack of evidence at a national scale about the relative contribution of development to current biodiversity loss.[39] However, there have been recent reported losses to Local Wildlife Sites,[40] while a 2005 study of lowland heathland indicated that biodiversity loss was occurring because of cumulative impacts of developments.[39] EcIAs are meant to consider whether cumulative impacts from other developments in the area will result in significant biodiversity loss (Box 4).[25] However, in practice this is poorly considered in EcIA reports.[6] Multiple small losses that are not considered significant, and therefore not material to individual planning decisions, can add up to a significant loss at a national scale.[26] There will also be biodiversity losses due to developments where EcIA is not required. In addition, Local Authorities are generally not requiring 'no net loss' for less-protected sites, and there is little use of effective compensation.[7,9,41-43]

Other causes of biodiversity loss from development include:

- an inadequate awareness and resourcing of the ecology function in Local Authorities,
- the poor quality of some Ecological Impact Assessments,
- a lack of research and ecological constraints for the effectiveness of mitigation and compensation techniques.

Box 4. Ecological Impact Assessment Stages

EcIA is based in ecological science, but also requires professional judgement.[26] It is not possible to measure all aspects of biodiversity that might be impacted. Instead, the ecologist decides which ecological features, such as species and habitats, meet a threshold of 'value' to biodiversity or society and will suffer 'significant' impacts.[25,26] An impact is considered to be significant if it will affect the integrity of a site or the conservation status of a valued species or habitat in a given area.[25] EcIA is an iterative process, but includes:[25,26]

- identifying alternative sites and project designs that might avoid loss or allow enhancements to biodiversity,
- deciding which biodiversity features need further investigation using existing data and additional surveys,
- determining how the valuable ecological features will be impacted, including indirect, off-site and cumulative impacts,
- developing the project design and mitigation measures,
- identifying what residual loss to biodiversity would remain after mitigation, and the ecological and legal consequences,
- reporting, which includes the residual loss and the likely success of avoidance, mitigation and compensation measures,
- monitoring of enhancement, mitigation and compensation and then rectifying ineffective measures or unexpected impacts.

Resources and Awareness of Local Authorities

Awareness and implementation of the Biodiversity Duty varies considerably between Local Authorities.[44] Local Authorities need to consider information in the EcIA report when making the planning decision. In 2011, about 40% of Local Authorities had an in house ecologist and there have been recent losses in biodiversity staff.[7,8] In some areas, a team of Local Authority ecologists at a regional level provide expertise at the local level. However, in a sample of planning cases from 2007, in nearly half the cases the planning officer received neither internal nor external ecological advice.[9] These cases had poorer outcomes for biodiversity.[9] Often the measures recommended in the EcIA report are not included as planning conditions and obligations,[45] and there is a lack of monitoring and enforcement.[46] Natural England also no longer routinely advises on individual cases.[8] Local Environmental Records centres are also essential to planning, as they manage biodiversity records. However, they are poorly used and resourced by local and central Government.[8,47]

Quality of Ecological Impact Assessments

There is a skills deficit amongst ecological consultants.[48] Developer budgets and time constraints can also restrict species surveys.[6] This contributes to a narrow scope for many EcIAs, often focusing on a few species with high legal protection and cultural value.[49,50] Mitigation of impacts on a few high profile species will not usually adequately protect other species and habitats. EcIAs also tend to undervalue aspects of biodiversity that have local importance.[49]

Poor Reporting of Impacts to Local Authorities and Public.

There is no standard method for reporting biodiversity loss.[51] Non-ecologists in the Local Authority might only read the non-technical summary of the EcIA report. However, over a quarter of EcIAs in a recent academic review did not state in this summary what residual biodiversity loss was expected.[52] In addition, although EcIA reports are meant to be publically available, they are often hard to access. The Association of Local Environmental Records Centres state that EcIA survey data are generally not shared with them.

Implementing Avoidance and Mitigation Measures

Alternative sites and project designs to avoid biodiversity loss are poorly considered.[6] This may occur if ecologists are consulted too late.[6] Developers do try to implement most of the recommended mitigation measures, but are hindered by the poor quality of mitigation proposals in some EcIA reports.[52] Opinion varies as to what extent it is possible to mitigate on site for impacts before using compensation off site. A project to improve the skills of ecological consultants is being led by the Institute of Ecology and Environmental Management, which is gaining chartered status.[48] The EcIA guidelines are being updated and a British Standard for biodiversity and planning will be published in 2013.[53]

Effectiveness of Mitigation and Compensation

A lack of research data and inadequate monitoring in all stages of EcIA means often it is not know if mitigation and compensation techniques are working.[10] Where monitoring does occur, measures such as bat and bird boxes are often considered successful simply if individuals are present.[54] However, the aim for European Protected Species is for a sufficient population to achieve a 'favourable conservation status'.[27] For example, wire bat gantries are used in England to guide bats over roads, such as the gantry over the A69 Haydon bypass costing £60,000.[55] However, a recent study showed that this gantry and three others do not work.[56] Previous monitoring studies of bat gantries have been criticised for only checking whether bats are present.[54,57] Defra plans to fund research into improved surveying of bats for road mitigation.[58] Natural England is reviewing available research and consulting ecologists on the effectiveness of road and rail mitigation techniques.[59]

Managing and Creating Habitats

There is a reasonable evidence base for managing habitats to maintain and improve their quality for biodiversity.[60] However, restoring or creating a particular habitat type where it does not currently exist is a developing science.[61-63] There has been some success with habitats such as ponds and lowland heathlands.[2,61] Some habitats such as wetlands can be apparently created quickly.[61] However, closer inspection shows it can take a long time and a lot of effort to get the same characteristics as natural habitats.[64,65] Creating habitats on former farmland may be particularly difficult due to high soil nutrient levels.[61] Certain habitats, such as ancient woodlands, are ecologically irreplaceable, so like for like compensation is not possible.[66,67]

Moving Species and Habitats

It is common to move individuals of some protected species from where development is occurring to habitat on or off the site (translocation).[68,69] There are many challenges to success, with inadequate monitoring and reporting again limiting improvements in practice.[70-73] Some whole habitats have been moved, but the limited evidence suggests most habitats do not retain their conservation value.[74] However, knowledge and practice is improving,[75] so some regard moving habitats as a better option than trying to create new habitat.[76] The government advisory body, the Joint Nature Conservation Committee, considers translocation to be partial compensation, not mitigation.[70,74]

Options for Protecting Biodiversity

Measures that might improve the existing planning system to address biodiversity loss include:

- Adequate resourcing of the ecology function in Local Authorities and their improved engagement with Environmental Records Centres would help to identify areas not appropriate for development.[47]
- Greater discussion between Local Authorities and developers prior to planning applications might help developers to provide the appropriate information.[5,9,38,53]
- Resources currently used by developers for translocation could be diverted towards better mapping of species and habitats, so that important areas can be avoided.
- A recent review of planning guidance considered the updating of Environmental Impact Assessment and Biodiversity guidance to be a priority.[77]
- Local Authorities could follow the Welsh model by appointing a "Biodiversity Champion".[47] A public registry of EcIAs might also raise the status of the Biodiversity Duty and improve accountability.[7]
- EcIA could be commissioned by Local Authorities, while still paid for by developers.[7] Some suggest EcIA could be requested as best practice for some developments, even if a full EIA is not legally required.
- Planning applications could be required to state how a development will achieve a net gain in biodiversity.[47]
- A panel of experts could review the quality of EcIAs for large developments, as occurs in the Netherlands.[78]
- Greater research into the impacts of development and the effectiveness of mitigation and compensation measures.[10] The new draft EIA Directive proposes that monitoring of significant impacts is required.[79]
- Mandatory Biodiversity Offsetting to ensure compensation for residual biodiversity loss.[7]

Using Biodiversity Offsetting for Compensation

Biodiversity Offsetting (POSTnote 369) is a tool for measuring the residual biodiversity loss and what compensation to provide.[80,81] Various types of metrics are used in different countries to combine aspects of a site, such as habitat type and condition, to give a number of 'biodiversity units'.[67] Defra is co-ordinating pilot studies with Local Authorities in six areas, with evaluation due in 2014 (Box 5). Developers voluntarily agree with Local Authorities to pay for the gain of at least the same number of biodiversity units as will be lost. This is done by creating new habitat or improving the condition of existing habitat. Offsetting is intended to operate through a market, with landowners such as farmers and charities carrying out the conservation work. Currently the only private broker is the Environment Bank, which matches developers with landowners and manages payments.[82]

Barriers and Opportunities for Developers

Developers would need time to adapt to mandatory offsetting. Proponents argue that offsetting would provide a clearer process across England, and for a reasonable cost removes the need for developers to manage compensation sites.[11,41] Some developers might use their land to provide compensation for their own or others' developments.

Box 5. The English Offsetting Pilots

Developers in six areas (Devon, Doncaster, Essex, Greater Norwich, Nottinghamshire and Coventry, Warwickshire and Solihull) are encouraged to voluntarily offset residual losses. Offsetting in England is intended primarily to address biodiversity losses on land without legal protection. It is not intended to bypass existing regulations or the mitigation hierarchy.[81] Any development permitted on protected sites continues to need bespoke compensation.[67] Habitat creation or improvements should be additional to what would have occurred with existing funding.[81] There are likely to be time-lags between the impacts of the development and provision of compensation.[83,84] Compensation areas should also be managed in perpetuity, or at least for the development's life span.[81,85] Most commentators in favour of offsetting in England prefer a mandatory system for developers with careful regulation.[86]

Offsetting Metric

The English offsetting metric operates so that loss in an area of lower biodiversity value habitat, such as intensive arable farmland, can be compensated for by creating a smaller area of a higher biodiversity value habitat, such as a heathland.[67] Alternatively, loss of the same area of farmland could be compensated for by improving the condition of a larger area of heathland.[67] However, loss due to development on higher biodiversity value habitats has to be compensated for with creation or improvement of the same habitat type.[67] Local Authorities would continue to make the final decision on where compensation is placed and would need to consider people's local access to nature.

Defra have a number of guiding principles, including that the English offsetting metric should be simple to understand and use.[81] Some think this metric is too simple to capture all the important aspects of biodiversity, such as species. Others question whether biodiversity can be considered as interchangeable.[12] Metrics are an approximation based on scientific understanding about how habitat type and condition contribute to biodiversity. Validation of the English offsetting metric has yet to be carried out to check the numbers assigned to different habitat types and conditions. There are also concerns about the methods for dealing with risks in delivering compensation.[12,87]

Opinions on Advantages and Risks of Offsetting

Proponents argue that offsetting working within guidelines will provide a net biodiversity gain.[11,82] The metric might make biodiversity loss clearer to planners, with limited evidence suggesting it could provide more compensation than current ideal practice.[41] Offsetting could also allow compensation to be pooled into larger restoration schemes, such as the Nature Improvement Areas introduced by the government.[2,81] This could help priority habitats and improve ecological networks.[2] Opponents argue that offsetting will reduce public funding for conservation and be used to justify environmentally damaging development.[12] Some fear that offsetting will separate people from nature and reduce avoidance and mitigation.[12] There are also concerns about using a market and brokers to provide conservation.[88] Biodiversity offsetting may contribute, but additional measures (outlined above) may still be needed to improve the consideration of biodiversity in planning decisions.

Endnotes

For references, please see:
http://www.parliament.uk/documents/POST/postpn429_biodiversity-and-planning-decisionsreferences.pdf

POST is an office of both Houses of Parliament, charged with providing independent and balanced analysis of policy issues that have a basis in science and technology. POST is grateful to Laura Harrison for researching this briefing, to NERC for funding her parliamentary fellowship, and to all contributors and reviewers. For further information on this subject, please contact the co-author, Dr Jonathan Wentworth.

These references refer to POSTnote 429 Biodiversity & Planning Decisions available at: http://www.parliament.uk/business/publications/research/briefing-papers/POST-PN-429

Endnotes

1 Berry, P, *et al,* 2011, *Status and changes in the UK ecosystems and their services to society: England. UK National Ecosystems Assessment Technical Report. Chp. 17.*
2 Lawton, J, *et al,* 2010, *Making Space for Nature: A review of England's wildlife sites and ecological network.* Report to Defra.
3 Maclean, N, 2010, *Silent Summer: The state of wildlife in Britain and Ireland*.
4 Natural England, 2010, *Lost life: England's lost and threatened species*.
5 Department for Communities and Local Government, 2012, *National Planning Policy Framework.*
6 Drayson, K, and Thompson, S, 2012, *In Practice. Bulletin of the Institute of Ecology and Environmental Management* **75**: 26-29.
7 Newey, G, 2012, *Nurturing Nature: policy to protect and improve biodiversity*. Policy Exchange.
8 Association of Local Government Ecologists, 2011, *Written evidence, Natural Environment White Paper*.
9 Tyldesley, D *et al,* 2012, *Effectiveness of the application of current planning policy in the town and country planning system.* Report to Defra.
10 Hill, D, and Arnold, R, 2012, *Journal of Applied Ecology* **49**: 6-9.
11 Briggs, B, *et al*, 2009, *Journal for Nature Conservation* **17**: 112-122.
12 Hannis, M, and Sullivan, S, 2012, *Offsetting Nature? Habitat banking and biodiversity offsets in the English land use planning system.* Green House Report.
13 Díaz, S, *et al*, 2006, *PLoS biology* **4**: 1300-1305.
14 Millennium Ecosystems Assessment, 2005, *Ecosystems and human well-being: Biodiversity synthesis*.
15 UK National Ecosystem Assessment, 2011, *UK National Ecosystem Assessment: Synthesis of the key findings.*
16 Cardinale, B, *et al,* 2012, *Nature* **486**: 59-67.
17 Marmot, M, 2010, *Fair society, healthy lives.* Report to the Department of Health.
18 Defra, 2011, *The Natural Choice: securing the value of nature*.
19 Defra, 2011, *Biodiversity 2020: A strategy for England's wildlife and ecosystem services*.
20 Natural Capital Committee, 2012, *Information Sheet.*
21 *Growth and Infrastructure Bill.* Bill 75 of 2012-13.
22 Wildlife and Countryside Link, 2012, *Briefing on the Growth and Infrastructure Bill.*
23 Commons Library Standard Note 6418, 2013, *Planning Reform Proposals.*
24 See POSTnote 254 *Farmland Wildlife* and POSTnote 418 *Balancing Nature and Agriculture*.
25 Byron, H, *et al,* 2006, *Guidelines for Ecological Impact Assessment in the United Kingdom*. Institute of Ecology and Environmental Management.
26 Treweek, J, 1999, *Ecological Impact Assessment*.
27 Directive 85/337/EC, codified in Directive 2011/92/EU of the European Parliament and of the Council on the assessment of the effects of certain public and private projects on the environment. *Official Journal of the European Communities*, 26.
28 European Commission, 2012, *Proposal for a Directive of the European Parliament and Council amending directive 2011/02/EU on the assessment of the effects of certain public and private projects on the environment.*
29 HMSO, 1999, *Town and Country Planning (EIA) (England and Wales) Regulations.*
30 HMSO, 2011, *Town and Country Planning (EIA) Regulations.*
31 Infrastructure UK, 2012, *National Infrastructure Plan: update 2012*.
32 There is also specific legislation for badgers and deer, largely focused on animal welfare, in the Badgers Act 1991 and the Deer Act 1991.
33 Law Commission, 2012, *Wildlife Law*. Consultation Paper 206.
34 Natural England, 2011, *Natural England Guidance Note: European Protected Species and the planning process.*
35 HC Deb 29th November 2011 c808.
36 Defra, 2012, *Report of the Habitats and Wild Birds Directives implementation review*.
37 Morris, R, 2011, *Land Use Policy* **28**: 361-369.
38 Penfold, A, 2010, *Review of non planning consents*. Department for Business, Innovation and Skills.
39 Land Use Consultants, 2005, *Going, going, gone? The cumulative impact of land development on biodiversity in England*. English Nature Report 626.
40 The Wildlife Trusts, 2011, *Status of English Local Wildlife Site systems 2011*.
41 Tyldesley, D, *et al*, 2012 *Application of a new biodiversity offsetting metric to an existing sample of real-life historic cases*. Report to Defra.
42 The Natural Capital Initiative, 2010, *Addressing practical challenges for biodiversity offsetting in the UK*.
43 Defra, 2011, *Options stage impact assessment: Offsetting the impact of development on biodiversity.*
44 Defra, 2010, *Review of the Biodiversity Duty contained in Section 40 of the NERC Act 2006.*
45 Tinker, L, *et al*, 2005, *Impact Assessment and Project Appraisal* **23**: 265-280.
46 Crook, A. *et al,* 2010, *The incidence, value and delivery of planning obligations in England in 2007-08*. Department for Communities and Local Government.
47 The UK All Party Parliamentary Group for Biodiversity, 2012, *Planning and the Natural Environment*.
48 Institute of Ecology and Environmental Management, 2011, *Ecological skills: shaping the profession for the 21st century.*
49 Latimer, W, 2009, *Planning Practice and Research* **24**: 389-408.
50 Harrop, S, 1999, *Biodiversity and Conservation* **8**: 679-707.
51 UK Green Building Council task group, 2009, *Biodiversity and the built environment.*
52 Drayson, K and Thompson, S, 2013, *Journal of Environmental Management.* In press.
53 BSI group, 2012, *Draft British Standard 42020 Biodiversity - A code of practice for planning and development*.
54 Altringham, J, 2012, *In Practice: the Bulletin of the Institute of Ecology and Environmental Management* **78**: 28-32.
55 HL Written Answer 134 24th July 2012.
56 Berthinussen, A, and Altringham, J, 2012, *PloS one* **7**: e38775.
57 Highways Agency,2011, *A review of bat mitigation in relation to highway severance.*
58 Defra, 2013, *Development and application of a surveying technique for bats pre, during and post road and rail construction to explore mitigation success.*
59 Natural England. *Review of mitigation effectiveness for road and rail schemes.* http://www.landuse.co.uk/mitigation-effectiveness-survey-natural-england
60 Sutherland, W, and Hill, D, 1995, *Managing habitats for conservation*.
61 Morris, R, *et al*, 2006, *Journal for Nature Conservation* **14**: 106-116.
62 Rey Benayas, J, *et al*, 2009, *Science* **325**: 1121-1124.
63 Suding, K, 2011, *Annual Review of Ecology, Evolution, and Systematics* **42**: 465-487.
64 Mossman, H, *et al*. 2012, *Journal of Applied Ecology* **49**: 1446-1456.
65 Fagan, K, *et al*, 2008, *Journal of Applied Ecology* **45**: 1293-1303.
66 Business and Biodiversity Offsets Programme, 2012, *Resource paper: Limits to what can be offset*.
67 Defra, 2012, *Biodiversity offsetting pilots technical paper: the metric for the biodiversity offsetting pilot in England*.
68 Platenberg, R, and Griffiths, R, 1999, *Biological Conservation* **90**: 125-132.
69 Edgar, P, *et al*, 2005, *Biological Conservation* **122**: 45-52.
70 McLean, I, 2003, *A policy for conservation translocations of species in Britain*. Joint Nature Conservation Committee.
71 Bullock, J, *et al*, 1996, *Review of information, policy and legislation on species translocation.* Joint Nature Conservation Committee report 261.
72 Germano, J, and Bishop, P, 2009, *Conservation biology: the Journal of the Society for Conservation Biology* **23**: 7-15.
73 Dalrymple, S, *et al*, 2011, *Are reintroductions an effective way of mitigating against plant extinctions?* Collaboration for Environmental Evidence Review.
74 McLean, I, 2003, *A habitats translocation policy for Britain*. Joint Nature Conservation Committee.
75 Anderson, P, and Groutage, P, 2003, *Habitat Translocation - a best practice guide.* (C600). Construction Industry Research and Information Association.
76 Stanhope, K, and Box, J, 2010, *Proceedings of the Institute of Civil Engineers - Civil Engineering* **163**: 123–130.
77 Department for Communities and Local Government, 2012, *External review of the Government planning practice guidance.*
78 The Netherlands Commission for Environmental Assessment. http://www.commissiemer.nl/english
79 European Commission, 2012, *Proposal for a Directive of the European Parliament and of the Council amending Directive 2011/92/EU*
80 Business and Biodiversity Offsets Programme, 2012, *Guidance notes to the standard on biodiversity offsets*.
81 Defra, 2011,*Guiding principles for biodiversity offsetting*.
82 The Environment Bank, 2012, *Biodiversity Offsetting: a general guide*.
83 Bekessy, S *et al,* 2010, *Conservation Letters* **3**:151-158.
84 Maron, M *et al*, 2010, *Journal of Applied Ecology* **47**: 348-355.
85 The Law Commission will publish a consultation paper on 'Conservation Covenants' in 2013. These are mechanisms to secure long-term private management of land for biodiversity. http://lawcommission.justice.gov.uk/areas/conservation-covenants.htm
86 For example: Newey, G, 2012, *Nurturing Nature: policy to protect and improve biodiversity*. Policy Exchange.
87 Moilanen, A, *et al,* 2009, *Restoration Ecology* **17**: 470-478.
88 Pawliczek, J, and Sullivan, S, 2011, *Environmental Conservation* **38**: 435-444