EXPERIENCE OF CUMULATIVE EFFECTS ASSESSMENT IN THE UK

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Cumulative effects assessment (CEA) is a development of environmental impact assessment which attempts to take into account the wider picture of what impacts may affect the environment as a result of either multiple or linear projects, or development plans. CEA is seen as a further valuable tool in promoting sustainable development. The broader canvas upon which the assessment is made leads to a suite of issues such as complexity in methods and assessment of significance, the desirability of co-operation between developers and other parties, new ways of addressing mitigation and monitoring. After outlining the legislative position and the process of CEA, this paper looks at three cases studies in the UK where cumulative assessment has been carried out - the cases concern windfarms, major infrastructure and off-shore developments.

INTRODUCTION

Man’s impacts upon the environment, and the impacts of human developments, may be direct or indirect, they may interact, and they may accumulate in time and space. This paper looks at the assessment of cumulative effects of developments where those developments either cluster to affect a "local" environment, or where a plan or programme of developments has the potential to give rise to accumulating effects.

The recognition that cumulative effects may be incurred as a result of human activities has been recognised in law since the USA National Environmental Policy Act of 1969 (NEPA, 1970) which first established a requirement for Environmental Impact Assessment (EIA) in the USA. In Europe, legislation to similar effect was first enacted in 1987. Directive 85/337/EEC sets out the terms for the assessment of the effects of certain public and private projects on the environment; this Directive was subsequently amended by Directive 97/11/EC to ensure, amongst other matters, that any cumulative effects are adequately addressed (see CEC 1985 and CEC 1997). Other Directives also include requirements for similar assessments of cumulative effects (see CEC 1992: the Council Directive on the conservation of natural habitats and of wild fauna and flora 92/43/EEC.). Ways of interpreting and assessing cumulative effects have been developed and handbooks for the assessment of cumulative effects have been published (CEQ 1997, Hegmann et al., 1999, Hyder Consulting, 1999). This paper presents some UK experience of cumulative effects assessment (CEA) and highlights issues that arise where such an assessment is attempted.

CEA is seen as offering opportunities for moving towards more sustainable forms of development. Cocklin et al. (1992) for example, suggest that the link between CEA and sustainable development “exists in the sense that cumulative effects analysis presents a framework for analysis consistent with the concept of sustainable management”. In other words, sustainable development is the objective or constraint, whilst the management of cumulative effects constitutes a way in which it may be achieved. Clark (1994) also recommends CEA as a tool for sustainable development. See Piper (2002) for an analysis which applies principles of sustainability analysis to cases of CEA.

DEFINITIONS AND LEGISLATION

Several definitions of cumulative effects exist, perhaps the most useful is that of Ross, 1998 (see below) but others have been proposed: "effects of the project under review in combination with the effects of other past, present or future human activities" (Ross, 1998).

Canter (1999), on the other hand, has stressed three themes in CEA, rather than defining the nature of cumulative effects. These themes are: “the need to address multiple actions representing potential sources of impact-causing activities; the consideration of multiple linkages (pathways) between such sources and receptors of impacts; and the recognition that such impacts may be additive, antagonistic or synergistic.”

These definitions and commentaries point to a number of issues that may arise, amongst these:

- which activities to consider, (local development activities or also, perhaps, impacts which have led to climate change?)
- the time-frame within which the assessment is to be carried out (e.g. to include past impacts as well as those expected in the immediate future – and what about induced future effects?)
- whether any gains (i.e. diminishing of environmental effects as a result of, for example, new technology introduced) may be used to offset any "losses" of environmental quality expected as a result of other developments.
Other important issues concern the methods to be used, how sensitive information may be collected where firms are in competition (see Ross, 1998) and how the significance of effects is to be adduced.

The concept of cumulative effects has been present in European Union legislation concerning EIA since the first Council Directive requiring EIA (85/337/EEC), on the assessment of the effects of certain public and private projects on the environment; Commission of the European Communities (CEC) 1985). The description of the likely significant effects of the proposed project on the environment should cover “the direct effects and any indirect, cumulative effects of a project – short and long term, and temporary or permanent, positive and negative effects of the project” (DoE, 1991, p. 62). Directive 97/11/EC, amending Directive 85/337/EEC, became effective at the end of the 1990s and provides that when determining whether a project requires assessment of its environmental effects, relevant selection criteria should include “the cumulation with other projects” and “the existing land use” (which may, of course, include existing developments). Other EC legislation already effective in promoting the study of combined effects of developments is contained in the 1994 Habitats Directive (European Commission Directive 92/43/EEC; CEC, 1992), which refers to major sites of nature conservation importance and in particular the Natura 2000 network of sites. The UK regulations which implement this Directive calls for “appropriate assessment” to be carried out by a competent authority before a “plan or project” which is likely to have a significant effect on a European site (i.e. a Natura 2000 site) either alone or in combination with other plans or projects”.

In other words, where the effects of two or more developments may act in conjunction upon such a site, an assessment of those combined/cumulative effects must be carried out.

More recently, the Directive on the assessment of certain plans and programmes on the environment (2001/42/EC - known as the SEA Directive) has extended this need to assess cumulative effects to plans and programmes, i.e. to a “higher” level in the hierarchy of planning and development. At such an earlier planning stage there may be more flexibility to change development decisions, though there may well be rather less information available on the precise nature of development type or technology and consequently the amount of, say, traffic, pollution and noise which may be generated.

PRIMARY SCREENING AND SCOPING ISSUES IN CEA

To recapitulate here the types of circumstances where CEA work may be required: two broad types of cases may lead to CEA: project-based cases and planning-based cases. The principal distinction between these two types is the certainty of the proposed development/s: i.e. whether they have been designed and funded and permission for construction is now being sought, or whether a final commitment remains to be made.

“Project-based cases” will include circumstances where a new development is to be constructed in the vicinity of another development and will impact upon the same environment, cases where two or more developments are brought forward contemporaneously such that they will affect the local environment in similar ways at the same time/s. Another form of project-based case concerns linear projects (such as a road, railway, pipeline or transmission line) which in crossing the land may repeatedly impact upon a valued component of the environment. Thus, for example, in crossing the county of Kent from London to the English Channel at Folkestone, the Channel Tunnel Rail Link cuts through, runs alongside or otherwise affects a series of wetlands, several chalk streams and a number of ancient woodlands. Within each of those environments the railway has the potential to affect a variety of endangered or protected species such as badgers and dormice.

Where CEA work is undertaken into project-based cases like these, good information will exist upon the nature of the developments being proposed: their size, inputs and outputs, labour force and capacity to affect the environment in various ways (waste production, traffic generation, etc.) In planning-related cases less information is known. We are assuming here that a plan is under consideration by an authority (e.g. local territorial authority, transport authority, resource authority) which would propose development of one or more kinds across what may well be a broad sweep of land. Such strategic plans might include

- a plan to increase housing within a region, taking into account needs for other infrastructure services
- a plan to improve transport within a locality, perhaps by changing modes, developing hubs, etc.
- a plan for water resource development within a catchment (which might combine infrastructure development with leakage reduction and conservation)
- a plan to move from carbon-based to renewable energy systems

In each of these cases not everything is determinate: technologies, sites, level of funding, routes, etc. remain to be decided, so a broad range of options must be included in the assessment.

Whether it is project-based or planning-based cases that are under consideration, the chief screening criterion for CEA is whether there is a likelihood that significant effects upon the environment will be generated, so that appropriate mitigation may be planned and also assessed. Scoping for that assessment must be carried out in such a way as to concentrate on the issue of significance – it is not difficult to envisage an array of effects that may arise in both types of case. The assessment needs to focus on the question of significance in order to avoid the mistake of undertaking an unnecessarily broad assessment. In order to achieve this, thought needs to be given to which components of the environment are particularly important and may be affected by the development. These components are referred to as VECs: valued ecosystem components. In addition, the boundaries of the assessment must be determined in time and space.

By selecting certain VECs as the focus of the assessment, the assessor making a judgement as to where effects may fall in the most significant way. The VEC chosen may be, for example, air quality or a protected wildlife species or group of species (more than one VEC may be chosen). It is implicit in this approach that impacts upon the selected VEC may in some way serve as a surrogate for wider environmental effects – if the effect on this VEC is significant then effects on other components...
of the ecosystem may also be significant. Moreover, it is suggested that impacts upon this VEC represent the likely pattern of incidence upon other components of the ecosystem.

With regards to boundaries in time and space, it is here that careful judgement is needed to accurately represent the range of issues that need to be taken into account. The spatial boundary, for example, must include all sites and territory likely to be affected by the combined effects. This may mean a series of disconnected sites (as in the case of the Channel Tunnel Rail Link as described above) and it may also include sites at some distance — e.g. sites from which resources for the developments assessed are quarried or where their waste is deposited. It is likely that sites across a wider area will be subject to CEA than is the case with normal project EIA but again, it is appropriate to leave out of the analysis any areas not affected by the combined projects.

When specifying the temporal boundary for the study, the Directives call for “past, present and future” developments to be taken into account. The current plans for development are known. The impacts of past developments may be more or less difficult to trace: certain species could have been lost from an area, the water table may have been affected over time, and soils may have become contaminated. It is not explicit in the legislation and accompanying regulations to what extent these changes need to be included in the assessment: whether or not a “benchmark” in the past needs to be set. In a heavily populated country such as a UK, most all land has been affected by past development and no return to a pre-Industrial Revolution environmental status is being sought; consequently it would not be feasible or reasonable to track all past change. As for “future projects”, as referred to in the Directives, these will include both those that are already known, well-planned and budgeted and for which planning permission is already being sought, and those which are much less well defined, such as any developments responding to future transport or labour needs resulting from current developments (e.g. where a strategic transport plan includes a new airport: how far must trends in likely passenger growth be predicted to cover the future needs for car parking space). Ross (1998) discusses problems with future project identification in Canada, whilst Rumrill and Canter (1997) have proposed, for the USA, a systematic decision process to determine when any possible future action should be included in an assessment. In such cases what is important is to provide a transparent account, appropriately calculated and sourced, showing what is included and has been assessed and what has not been included, together with the level of uncertainty about future projects and their impacts.

**PROCESS AND METHODS**

Process and methods for CEA draw upon those developed for EIA. Good accounts of process and methods can be found in the published documents of the USA Council on Environmental Quality (1997), the Canadian Environmental Assessment Agency (Hegmann et al. 1999) as well as a European Commission publication (Hyder, 1999). Table 1 summarizes an eleven-step process to be followed within three broad stages: scoping, description of the affected environment, and determining the environmental consequences of the proposed projects or strategic plan. The process leads to mitigation measures and the monitoring of effects.

The methods used in CEA are essentially similar to those of EIA more generally, and include those shown in Table 2. Some special evaluation methods are included in italics.

Table 1. - Eleven steps in CEA

<table>
<thead>
<tr>
<th>EIA component</th>
<th>CEA steps</th>
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<tbody>
<tr>
<td>Scoping</td>
<td>1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals</td>
</tr>
<tr>
<td></td>
<td>2. Establish the geographic scope of the analysis (e.g. ecosystem)</td>
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<td></td>
<td>3. Establish the time frame for the analysis (include projects in non-immediate time-frame — past and reasonably foreseeable future)</td>
</tr>
<tr>
<td></td>
<td>4. Identify other actions affecting the resources, ecosystems and human communities of concern.</td>
</tr>
<tr>
<td>Describing the affected environment</td>
<td>5. Characterize the resources, ecosystems and human communities identified in scoping in terms of their response to change and capacity to withstand stresses.</td>
</tr>
<tr>
<td></td>
<td>6. Characterize the stresses affecting these resources, ecosystems and human communities and their relation to regulatory thresholds.</td>
</tr>
<tr>
<td></td>
<td>7. Define a baseline condition for the resources, ecosystems and human communities.</td>
</tr>
<tr>
<td>Determining the environmental consequences</td>
<td>8. Identify the important cause and effect relationships between human activities and resources, ecosystems, and human communities.</td>
</tr>
<tr>
<td></td>
<td>9. Determine the magnitude and significance of cumulative effects.</td>
</tr>
<tr>
<td></td>
<td>10. Modify or add alternatives to avoid, minimize or mitigate significant cumulative effects.</td>
</tr>
<tr>
<td></td>
<td>11. Monitor the cumulative effects of the selected alternative and adapt management.</td>
</tr>
</tbody>
</table>

Source: CEQ, 1997, p. 10

Table 2.

| Scoping and impact identification methods: | Questionnaires, checklists (simple, detailed), professional judgement, panels, interviews, matrices, pathways/networks, spatial analysis |
| Prediction and evaluation methods | Modelling (e.g. noise, air dispersion, oxygen sag models), professional judgement, case study analogue, GIS, overlay mapping, photo-montage, wireframe, trends analysis, indices, public participation; Special methods: carrying capacity analysis, ecosystem analysis, economic and social impact analysis |
Cooper and Canter (1997) have reviewed the use of various EIA methodologies in CEA, based on the experience of 25 practitioner respondents in the USA — though there are problems with their analysis (see Piper 2001) — the analysis showed that professional judgement was the most commonly used approach, followed by forms of computer-based modelling (including GIS). Piper (2001) compares methods used in four CEA cases in the UK. It seems likely that there is scope for the development of further methods, particularly computer-based methods. As the aim and purpose of the methods used is to assist in the decision-making process by providing reliable, transparent and appropriate information, methods will not be the same in all cases. These methods and their values are discussed at length in CEQ 1997.

CASE STUDIES

Three case studies are briefly described here, to provide a flavour of work undertaken by EIA practitioners in the UK in recent years, and as a means of illustrating the methods and procedures used. Certain issues that arise are discussed in section 6 below. The first case concerns a series of windfarm projects, and this is described with reference to the eleven steps outlined in Table 1. The second is concerned with a cluster of developments adjacent to the Humber estuary and important wild bird habitats, while the third relates to a strategic plan for development of Liverpool Bay.

Holderness Windfarms

Two proposals for windfarm in a coastal region of very flat topography (Holderness, Yorkshire) came forward within months of each other, followed another from a third developer; further similar developments were known to be likely in the same area. The windfarms consisted of between 3 and 13 turbines, each with an overall height of between 62 and 80 m to blade tip. A CEA study was commissioned by the local planning authority, in part because it was aware of local concern about landscape impacts and so wished to be able to provide information to any Public Inquiry that might be called. Wind turbine planning applications have frequently changed in design after an application has been submitted (number of turbines, capacity, size), in part because the technology is developing rapidly. The competent authority determining permission for windfarms in the UK is the local planning authority in the case of small developments, but where a windfarm exceeds 50 MW production, a central government department (Department of Trade and Industry) is the competent authority. This was the case with one of the proposals. The information that follows is derived from published studies and discussions with staff of the local planning authority and the consultants, see Piper (2001) for further details. For a description of the Holderness landscape, see: www.countryside.gov.uk/LivingLandscapes/countryside_character/yorkshire_and_the_humber/holderness.asp

Scoping

Scoping for this study (CEA step 1), was carried out by the local planning authority assisted by statutory consultees, with cumulative landscape and visual impacts of the windfarms to be assessed. Potential impacts upon birds (raised as an issue by English Nature and the Royal Society for the Protection of Birds (RSPB) at the environmental impact assessment stage) were not assessed.

The spatial boundary of the study (CEA step 2) was set as the maximum distance (about 20 km) at which the windfarms might be seen. Past impacts upon the region (CEA step 3) and past trends were not discussed. Other windfarm projects which might be considered “reasonably foreseeable future developments”, known to be under consideration at the time of the study, were not included in the assessment, nor were other current development activities affecting the landscape (CEA step 4). Where a gas terminal had already changed the landscape, the study stated that new wind turbines “will not cause substantial further effects”.

Environmental baseline

Following the scoping directions, CEA step 5 (characterization of the baseline environment) is restricted to describing the landscape in terms of landscape character and in terms of “capacity to absorb the development”. Countryside Commission guidelines on landscape character assessment were used here (County-side Commission, 1993), together with other guidelines. The landscape character units were redefined to a detailed level: e.g. Coast and Undulating Farmland character area, Drained Farmland character area and Heritage Coast.

Factors in determining the significance of impacts were deemed to be:

- the degree of change to designated land (here: Spurn Head Heritage Coast);
- the intrinsic change character of the landscape, and
- the potential visibility of the site and projects.

No clear criteria were established for assessment of each landscape’s capacity to absorb development, though judgements are implicit in the description of the impact of development on the landscape character units. For example: “The impacts upon the Coast and Undulating Farmland are likely to be particularly marked even at distances of over 5 km from the site. The continuity in character and the defining quality of a simple, yet generally not attractive coastal landscape, would be undermined to a degree by the introduction of turbines in this character area.” (ERYC, 1999b).

No regulatory thresholds applied in this case (CEA step 6) — such thresholds are more commonly set with respect to air and water emissions. Whilst the baseline conditions for relevant resources (landscape) and human communities in the district were described (CEA step 7), they were not mapped in the study report.

Determining the environmental consequences

In predicting impacts (CEA step 8), the study considered both the local and wider scales. It did not, however, describe at any length the size or make-up of human communities affected by the windfarm developments. There is a reference to car drivers passing on a local road. There was no mapping of villages or outlying settlements lying within specified radii of any windfarms. Again, this would have been useful.

Moving on to CEA step 9, magnitude and significance were expressed in terms of dominance and the sensitivity of the landscape. For example it was stated that a local landscape near one windfarm site “would become a landscape dominated by vertical structures whose defining characteristic is the movement of 54 m diameter rotor blades.” It was noted that there were no land cover features that might counter that dominance (e.g. tall buildings, forest) (ERYC, 1999a, p. 5).
A set of five thresholds relating the visual dominance of a wind turbine to distance from the turbine was also devised by the consultants, e.g.

<table>
<thead>
<tr>
<th>Distance (km)</th>
<th>Visual Impact</th>
</tr>
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<tbody>
<tr>
<td>0-2</td>
<td>High visual impact</td>
</tr>
<tr>
<td>2-5</td>
<td>High-medium or medium visual impact</td>
</tr>
</tbody>
</table>

No recommendations on mitigation are made in this report, nor is any monitoring suggested (CEA steps 10 and 11). These activities were not included in brief to the consultants, but best practice would indicate these are essential items in any CEA.

**Middle Humber**

During the mid-late 1990s, plans for a series of industrial developments were put forward for a site on the north bank of the Humber estuary (Yorkshire). The developments included a power station, a wastewater treatment pipeline from a nearby new wastewater treatment plant, and two docks developments (one a ferry terminal). In addition, flood defences were to be raised along much of the adjacent north bank, in order to safeguard the city of Kingston upon Hull. Thus, in this case four developers were involved and a total of five competent authorities were required to determine - under five different statutes - whether permission to build would be given. Immediately to the east of these developments lies a site of international importance, the Humber Flats and Marshes Special Protection Area (SPA) for feeding and breeding at different seasons of the year.

In this case EIAs had been prepared, or were being prepared, for the different developments. At the instigation of the local planning authorities, a CEA was commissioned to assess in a single exercise the cumulative effects of all the developments at the construction and operational stages. The CEA focussed upon migratory birds using the coastal marshes, but also considered effects upon local traffic conditions, estuary water quality and any changes to the estuary bed resulting from deposition or scour following changes to the bank.

This case is of interest in that, as the developers were not in competition with each other and were prepared to co-operate to share information, the CEA could be conducted without great difficulty and a number of benefits could be proposed. These included:

- the modification of construction schedules to avoid excessive impacts upon the birds at sensitive times of the year,
- the scheduling of daily working hours for construction workers to reduce traffic load on local roads, and
- the re-use of spoil from pipeline tunnelling for building the flood defences.

Moreover, mitigation and monitoring work was shared between developers.

**Liverpool Bay study**

A somewhat different study, carried out for the Countryside Commission for Wales into a strategic plan for the development of Liverpool Bay (UK west coast), made extensive use of GIS. This bay to the north west of Merseyside is the site of numerous activities currently and in the past: dredging, positioning of marine cables, oil and gas pipelines, fishing, shipping lanes and waste dumping (now terminated). The bay is fringed by a number of sites designated for their wildlife habitats. At the time of the study a number of large offshore windfarms were being proposed - some have now come on-line. Given the complexity of the area a GIS was used to map activities and habitats; an area approximately 60 km x 60 km was covered in the GIS.

The VECs identified as a focus for this study were the common scoter - a species of duck - and feeding grounds forplace and sole that lie within the shallow bay. By overlaying certain GIS coverages, areas used by scoter, sole and plaice for different purposes (breeding, feeding, etc.) could be shown, and areas impacted by a suite of human activities could be identified at the stages of construction and operation of the windfarms. In this case significance was estimated in terms of the vulnerability of the Valued Ecosystem Components, using the following expressions,

\[ V_1 = E \times S \]

where \( V_1 \) = vulnerability ranking, \( E \) = exposure ranking, \( S \) = sensitivity ranking.

Then, to account for the potential ability of a habitat or species to recover from an impact:

\[ V_2 = V_1 \times R \]

where \( V_2 \) = vulnerability score accounting for recoverability, and \( R \) = recoverability.

The outputs of this study (CCW, 2002, available from website) include the GIS coverages showing use of the bay, and the estimates of vulnerability of habitats and species as a guide to where mitigation is required and for what purpose.

**DISCUSSION**

The three case studies demonstrate something of the methods and process of both project-based and planning-based CEA. A number of issues arise in these cases and merit comment.

**Complexity**

It is apparent that CEA work can be of great complexity in terms of resources affected and the routes to those impacts, as well as in terms of authorities and statutory controls involved. This will mean that considerable expertise, consultation and planning will be required in the CEA process. Nevertheless, a CEA study may be a way of reducing duplication of effort (by several developers in a cluster) and also expose cumulative effects issues at an early stage (in the case of plan-related CEA) thus focussing effort upon feasible developments.

**Co-operation and confidentiality of information**

In some cases where projects coincide to affect natural resources, developers may be prepared to co-operate in order to speed the process of gaining permission to construct, sharing costs and intellectual inputs. This is more likely where the projects involved are different in nature to each other. Where such cooperation can be achieved there may well be benefits to all concerned, particularly in terms of mitigation and monitoring (see Piper, 2000).

In the case of concurrent and similar developments (e.g. windfarms), each developer may be unwilling to divulge information about his plans to a consultant undertaking an EIA for another developer, especially where there is a "chain" of developers awaiting planning permission and there is a belief that not all projects will be successful in gaining permission. This means that the developers are unlikely to work together and it will be appropriate for the competent authority to commission any necessary CEA work. In the strategic planning case described above (Liverpool Bay) the nature conservation authority (Countryside Commission for Wales) undertook to commission and fund the study, which was
intended partly to devise methods for use elsewhere and to be a step towards safeguarding biodiversity in Liverpool Bay.

**Process issues**

Any study of cumulative effects will need to make explicit how the significance of impacts is to be determined - and this will require consideration of the spatial boundary, the boundary in time (in terms of past, present and future projects) and which VECs are selected to represent the impacts of the developments. A larger spatial boundary may make impact levels appear smaller, and the way in which past and likely future environmental impacts are dealt with will also affect assessments. Consultation with stakeholders and experts will help resolve these issues, but transparency and careful record-keeping are necessary to ensure that the basis of assessments is valid and is well-understood.

**Significance and mitigation measures**

There will be issues such as when work is to begin and whether construction work may be phased (as a mitigation alternative). There may be scope for aligning the technologies of the various developments (e.g. waste recycling and control).

**Project vs. planning-related CEA**

Two types of cases where CEA may be required have been outlined: cases where projects have been finalized and full information is available, and cases where the assessment is being made of a strategic plan, in which case much greater flexibility may remain possible in terms of location and nature of projects. Thus there may be a trade-off between more information (at a stage when projects have been fully designed) and more available options (at a stage of strategic planning). In both circumstances, the commencement of CEA work as early as possible will mean more opportunities for modification of the projects or plans in order to mitigate deleterious effects.

**Consultation and participation**

Within the European system of EIA there are requirements that opportunities be provided for consultation with both statutory consultees (e.g. government bodies with particular responsibilities for environmental resources) and for public participation. It is worth noting, however that whereas public participation upon the impacts of individual projects is generally well provided for in the regulations, in the case of cumulative effects there is likely to be less opportunity for local people to have an opportunity to be made aware of them. That is, each developer may make clear the impacts of each development, but the process does not insist that cumulative effects are brought together and presented for evaluation by the public.

**CONCLUSION**

This paper has attempted to provide an outline of the status of CEA work in the UK, noting some of the difficulties and benefits of the process, the methods that may be used and the issues that arise. It is an area which is still under development - rather more experience of CEA exists in the USA and Canada, and there are opportunities to learn from this experience despite the differences in the type and scale of projects generally between North America and the UK.

For the future, the areas within which development of practice in CEA would be desirable concern issues such as the determination of significance in cases where several developments are likely to impact upon a resource, or where current developments proposals add to the effects of past projects upon the environment. Another research topic is how mitigation and monitoring may be handled where several developers are involved. Canadian experience is particularly interesting in the area of setting up fora for continuing the monitoring of both impacts and mitigation.

CEA can be a tool for sustainable development in both plan and project related cases. In particular, it provides an opportunity for the consideration of wider effects - such as impacts resulting from climate change - at a more realistic level.

**REFERENCES**


