



# SELECTED PROCEEDINGS

**Incorporating Principles of Sustainable Development within the Design and Delivery of Major Projects: An international study with particular reference to Major Infrastructure Projects**

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## ABSTRACT

Sustainable development now has critical implications for the planning, appraisal and implementation of major projects. This particularly concerns environmental and social factors, which form a major influence for project development and also pose potentially serious risks for project implementation. This paper reports the findings from a recent study by the OMEGA Centre at University College London, commissioned by the Institution of Civil Engineers (ICE) and Actuarial Profession (AP), on how better to incorporate environmental and social dimensions of sustainable development into the planning, appraisal and delivery of major infrastructure projects.

The study confirms there has been growing interest in establishing appraisal methodologies that properly address the widening range of environmental and social concerns. It follows that whilst financial appraisal is essential for commercial investors, incorporating the environmental and social factors of sustainability within a project requires a broader approach to appraisal that provides effective understanding and clarity as a basis for decision making. The work concludes that there are major advantages in adopting a 'policy-led' Multi Criteria Analysis (MCA) of major infrastructure projects *throughout* all stages of a project's lifecycle. This is advocated because MCA can do much to highlight stakeholder's key interests, integrate the use of different appraisal tools, identify which interests/criteria are important/appropriate by stakeholder category (detailing why, where and when), identify which criteria should receive priority in accordance with policy and resource scenarios and indicate how trade-offs between tangible and intangible criteria are best made, and in a transparent manner.

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## STUDY CONTEXT AND WORK PROGRAMME

30 This paper sets out the main findings of a commissioned Study carried out by the OMEGA  
Centre at University College London (UCL) for the Institution of Civil Engineers (ICE) and  
the Actuarial Profession (AP). The Study was undertaken with the purpose of developing  
recommendations for updating the sponsors' RAMP (Risk Analysis and Management for  
35 Projects) Handbook (*1*) on how better to incorporate environmental and social dimensions of  
sustainable development in the appraisal of major projects.

The assignment was commissioned in light of the growing international importance  
given to the concept of sustainable development to infrastructure development as reflected in  
the new ICE Mission Statement. This has the overall vision of civil engineers as being "at the  
heart of society, delivering sustainable development through knowledge, skills and  
40 professional expertise." This challenging mission statement, among other things, looks  
toward practice that is more sensitive to the requirements of sustainable development in all  
activities involving civil engineering, and related actuarial expertise, in the planning,  
appraisal and implementation of major projects.

The principal aims of the RAMP Study (*2*) were therefore defined as:

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- To identify and understand the strengths and weaknesses of current practices  
regarding the methods employed to address social and environmental considerations in the  
appraisal of major projects in the UK and elsewhere. 'Appraisal' here refers to pre-project  
completion assessments undertaken to inform decision making in the planning and  
50 implementation of projects.

- To develop and recommend a 'good practice' appraisal framework which takes into  
account the weaknesses and strengths of past appraisal methodologies and which incorporates  
new concerns of the 21st Century that set financial and economic risks and returns firmly  
against social and environmental risks and opportunities. Good practice has been used here  
55 to avoid the use of the term 'best practice' which can lead to insensitivity to varying  
circumstances, through applying standard a templates of professional practice irrespective of  
context. 'Good practice' offers generic lessons that take account of different contextual  
circumstances (*3*).

- To examine the applicability of the principles contained in the RAMP Handbook to  
60 the recommended 'good practice' framework developed with emphasis paid to risk  
management dimensions of the conception and development (planning), delivery and  
operation of major projects.

- To pay particular attention in the new appraisal approach to expressing social and  
environmental considerations and risks in financial terms (as far as this may be possible),  
65 taking into account the precautionary principle and possible conflicts of interests, so that they  
may be included in investment models with the assistance of scenario planning  
methodologies.

- To prepare a new draft chapter for the next edition of the RAMP Handbook setting  
70 out lessons and guidelines for major project appraisal which focuses on the challenges of  
better incorporating sustainable environmental and social considerations in line with the  
preceding Study aims

To address these aims, a Study work programme consisting of four main stages plus a  
supporting Seminar was constructed. This work programme was carried out between January  
75 2009 and June 2010. It was based in good part on the approach and methodologies being used  
for the OMEGA Centre in its international study of MUTPs (*3*). This pays particular attention

to the treatment of risk, uncertainty and complexity (and the importance of context) in decision making in the planning, appraisal and delivery of such projects.

The key stages of the work programme included:

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- *A review of relevant literature*, involving eight commissioned papers prepared by researchers and practitioners from different professions and perspectives, synthesised into a ninth paper to form the Study's Literature Report.

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- *An international survey* of key decision-makers and professionals involved in infrastructure development. This comprised 57 interviews among representatives of international organisations, national governments, private sector interests and academia, and across four case study countries (UK, France, Sweden and USA).

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- *Analyses of the material from these two stages* focused on the RAMP Handbook principles and structure, with the aim of developing a new appraisal framework for incorporating environmental and social aspects of sustainable development within the RAMP process. This provided the basis for preliminary proposals for the draft chapter of the RAMP Handbook.

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- *A seminar to discuss the findings of these analyses*. The seminar was attended by two dozen invited delegates, all experienced and influential professionals in the field of major infrastructure projects. Their discussions provided informative feedback on the analysis and preliminary recommendations.

## STUDY FINDINGS

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The following section outlines the main study findings derived from the above stages. The findings are fully explored in the OMEGA RAMP Study Final Report (4) which is available from the author. The findings are structured under three sub-sections supported by key statistics from the OMEGA RAMP questionnaire surveys. The first sub-section serves to introduce the principle challenges identified by the study as they relate to incorporating social and environmental factors into decision making of major transport projects. The second presents a review of common project appraisal techniques with regards to the principle challenges identified above and presents the case for using broader appraisal frameworks for major project appraisal. The third sub-section presents the studies recommendation for the use of policy led multi criteria analysis as a principle framework for major project appraisal.

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### **The challenges of incorporating environmental and social factors in decisions on major infrastructure projects**

#### *Economic growth*

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Traditionally, the underlying principal aim of most major infrastructure projects has been the delivery of economic growth on the basis of the trickle-down economic benefits which they are predicted to generate. The study findings indicate that today this premise is challenged by a broader agenda of multiple development aims as reflected in the concept of sustainable development, defined by the Brundtland Report (5) as "meeting the needs of the present generation without compromising the ability of future generations to meet their needs". This concept in effect re-defines the order of development priorities that major projects should contribute to and even the manner in which they should serve such goals.

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This definition also implies a very important shift - from an idea of sustainability as a primarily ecological concept to a framework that also emphasizes the economic and social

dimensions of development - underlining the need to balance all three dimensions of sustainability: economic, environmental and social. More recently, a fourth pillar of sustainability has been introduced, namely the institutional dimension (see 6; 7). Here the premise is that without adequately resourced sustainable institutions to promote, govern and regulate the delivery of sustainable visions, the delivery of sustainability is highly restricted

### *Global challenges*

There is significant growing international concern over global challenges, including climate change and energy depletion. This has led to the evolution and implementation of policies at international and national levels which are designed to focus action on tackling these challenges. These include global development strategies such as the *Agenda 21* (8), the *UN Millennium Development Goals* (9) and the *EU Strategy for Sustainable Development* (10).

**Agenda 21:** Arguably the most fundamental overarching and influential policy document regarding sustainability adopted at the Rio World Summit in 1992. It described a global programme for the achievement of sustainable development and called on all countries to develop sustainable development strategies. These strategies are required to incorporate a clear policy framework, including goals and objectives, with sustainability indicators to monitor the achievement of the policies, goals and objectives, with achievements judged through the implementation of projects that need to be appraised against these goals/objectives and their related criteria/performance indicators.

As a result of the above developments, over the last decade and more, many different institutions, sectors and governments have sought to provide their own definitions of sustainability or sustainable development. These are typically characterized by similar visions, goals and objectives, presented in strategies which subsequently form the basis of indicator frameworks. The extent these visions justifiably differ from place to place or culture to culture, and to what extent they influence or facilitate sustainable decision making across sectors remains unclear in many instances. This because the concept of sustainability is still in its infancy and its operationalisation is very much in its early stages.

**Millennium Development Goals (MDGs):** While the MDGs do *not* explicitly refer to sustainable development, this concept underlies all the eight goals to be achieved by 2015. The MDGs were designed to respond to the world's main development challenges and are drawn from the actions and targets contained in the Millennium Declaration that was adopted and signed during the UN Millennium Summit in September 2000. The MDGs are influential goals of policy relevance that are expected to be taken into account by committed organizations (i.e., signed up nations, donor agencies, etc.) when deciding whether to fund investment, aid, development projects and programmes. In this regard, the MDGs offer an invaluable overarching policy framework for infrastructure planning, appraisal and delivery as they highlight the critical ends that infrastructure developments must serve.

**EU Sustainable Development Strategy:** The EU Sustainable Development Strategy is based on the Rio Declaration and Agenda 21, but incorporates a problems-based focus to its strategy by identifying the key challenges to be addressed. This has a more binding (yet still guiding) role for EU member states' policy development and offers a sound basis for national sustainability strategy development. The EU Sustainable Development Strategy makes explicit reference to sustainable infrastructure (transport in particular) and thus could be perceived as a vision for the development of major infrastructure investment.

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*Environmental factors:*

These relate primarily to physical elements. These include some more tangible items, such as air pollution and noise, which relate particularly to the immediate impact of human activities. There are also less clear-cut ones, which have a physical dimension, such as landscape quality, where assessment leans more towards judgement rather than measurement. Most environmental factors have been subject to attention and assessment for many years, through such processes as Environmental Impact Assessment (EIA), now a statutory requirement for project approval across much of the world.

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*Social factors*

Concern the quality of life for individuals and communities. These include aspects such as equity in access to services. Much less specific attention has been paid to these concerns. In part this is because they often have political connotations. They are also less easy to define; especially as judgement is required, even where measurement is possible (e.g. in terms of access to goods and services). Treatment of social factors must particularly address the concept of poverty alleviation; this forms a core element of sustainable development in the Brundtland Report and a key objective of international funding agencies such as the World Bank.

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There are in fact close links between environmental and social factors. In overall terms, the maintenance of eco-systems is critical to maintaining human economic and social well-being (11); this is regularly highlighted by news reports of catastrophes and failures across the world). At a specific level, attributes such as landscape have physical form but involve human (social) judgement (e.g. changes to a piece of landscape through construction of a new road or railway line might be considered highly destructive by some communities, i.e. those who live there, but relatively unimportant by others, i.e. those travelling through the area).

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Environmental and social factors form key risks for any project. Although a comprehensive appraisal process should identify and weigh up all potentially relevant factors, this process can never achieve total certainty. Risks can arise in terms of any of the environmental and social aspects. Examples might include:

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- The combined effects of routeing, materials and extreme weather might create run-off which causes serious deterioration of water quality over an area, creating problems with farming, industry and health.
- The scale of objections over the landscape implications of the project require redesign and rerouting of a section, adding to development and construction costs and causing significant delay.
- Enhancement in the activities of a main town through improved travel causes reductions in the activities of local centres, worsening job opportunities and access to facilities by poorer groups around those centres. This adds to the costs of public authority sponsors of the project.

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Some factors may seem to be remote and very difficult to value anyway. The chance may also be extremely low of a risk arising in connection with them. But if they do come into the equation, they could have a grave impact. What value, for example, might be attributed to a highly reputed early Norman church? What extra capital might be justified to avoid

demolishing it? Or to leave it undisturbed? Such examples may prove very difficult to handle.  
 235 But there can be major risks associated with not appraising correctly environmental and social factors; e.g. losing the support of key stakeholders, failing to identify the best way to achieve stakeholder objectives or creating unacceptable impacts that subsequently prove very costly to cure.

### 230 *Trade-offs in decision making*

The increasing importance attributed to visions of sustainable development has persuaded more and more project sponsors to emphasise the formulation and presentation of a 'sustainable business case' as part of their infrastructure development approaches. It is rarely  
 235 possible to address all environmental, social and economic factors equally within a project and thus decision-making frequently requires major trade-offs and compromises in order to achieve project aims and objectives. The need to manage the risks, uncertainties and tensions generated by these trade-offs brings to the forefront the importance of establishing appropriate and transparent sustainable institutional capacities and governance frameworks.  
 240 This is critically important because many institutional frameworks for major projects are often too fragmented and silo-based to competently undertake assessments which arrive at acceptable compromises.

### *Sustainability*

245 Few practitioners now publicly share the former conventional view that economic growth should be the sole, even dominant, concern of project appraisal. Indeed 81% of survey respondents (4) acknowledged that economic growth should not be 'king' of all appraisal criteria. But there remain differing views on what sustainability actually involves, and how  
 250 infrastructure projects might be best framed to achieve it. In consequence, there is a need to appreciate that doubts remain over how far current projects satisfactorily address environmental and social dimensions of sustainability. Decision-makers should be aware that this is essentially because the concept of sustainability is still in its infancy, while its operationalisation is very much in the early stages.

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### **Project Appraisal and the case for broader appraisal frameworks**

There exists a range of methodologies for infrastructure project appraisal. These can be differentiated by their purpose, coverage and intended output. For commercial investors the  
 260 crucial focus must be on the financial results, in terms of forecast flows of expenditure and income, to assess whether their investment will provide an acceptable return (this may be referred to as Financial Cost Benefit Analysis). The results are usually summarised in terms of the Net Present Value (NPV) of the project.

Beyond this, there is a wide range of methodologies, especially for wider planning  
 265 (see 12). For project appraisal the methodologies currently in use to assess all factors can ultimately be considered as falling within two main types: Cost Benefit Analysis (CBA) (sometimes referred to as Social Cost Benefit Analysis) and Multi Criteria Analysis (MCA).

#### *Cost benefit analysis*

270 CBA generally forms the principal basis for most traditional project appraisal, particularly for infrastructure developments. All projects require funding and large projects obviously demand very large sums, which may come from governments and international agencies as

well as commercial sources. While commercial funding bodies will be primarily interested in obtaining a good return from funds invested, non-commercial organisations, including governments, wish to identify that the expenditure of funding brings a return that offers ‘value for money’; i.e. something beyond purely conventional economic dimensions. Typically, all projects looking beyond a purely commercial return involve some element of public money and thus there will be competition between projects for public funds; a serious issue for major projects, especially at times of restricted public funding.

Although it is rarely identified in specific terms, the use of CBA is effectively generic: i.e. it is often claimed by its advocates that it can be used on a similar basis in *any* circumstances, regardless of context. In this way, it becomes a simpler and thus more attractive appraisal tool to use in that it is presented as being implicitly free of value judgements. It is actually questionable whether CBA is value free, given that the ultimate figure in the CBA process for any one project is based in part on monetary values that are derived from assumptions and attributions adopted by the modeller and presumably from the context to which the method is applied.

A hallmark of CBA is that *all* benefits and all costs are ultimately expressed in monetary terms, and are adjusted for the time value of money at which they occur. Thus all flows of benefits and flows of project costs over time (which tend to occur at *different* points in time) are expressed on a common basis in terms of their “present value” (usually Benefit: Cost Ratio - BCR). So the central feature of preparing a CBA appraisal is setting prices and costs on all factors: i.e., monetization.

A very considerable amount of research and development in establishing these price and cost factors has taken place over decades and continues today (13; 14). The determination of costs and prices starts from the basic economic principle that there exists a ‘perfect market’ where *all* actors are aware of *all* factors; although in many respects much of the continuing research on CBA addresses the practical situation of ‘market failure’ (15). Many economists consider that it is either still possible to establish sound figures despite such market failures or that such efforts at CBA are superior to other alternative appraisal methods available. A closer examination of the views of some other professions, however, challenges the validity of the data derived from this approach and points to other potential opportunities (16), indeed 91% of the OMEGA RAMP survey respondents disagreed with the premise that monetization is essential to sound project appraisal.

Establishing monetary values for environmental and social factors of development (sustainable or otherwise) gives rise to several issues:

- It requires analysis and interpretation of what are often sensitive variables, but it also assumes reasonable accuracy. In practice there is always a possible margin of error with every variable. Since a (Social) CBA uses several factors in compilation, there is a risk that these may be compounded and lead to a significant error in the final figure.

- A single set of numerical data also leaves open concerns over how it was calculated: the ‘black box’ issue. The lack of transparency inherent in many aspects of traditional CBA precludes decision-makers from properly understanding the project and its impacts, even if reasonably sound figures could be identified for monetising all the various factors in project appraisal. Some critics argue that the use of CBA as the principal platform for project appraisal may actually prevent key decision-makers from being in a position to balance out the various interests and priorities of differing stakeholders throughout the project lifecycle.

- The values developed so far tend to be easier ones to measure confidently. Thus the factors considered in a (Social) CBA are really limited to those where some form of numerical interpretation is possible and by implication other factors, however important in

principle, are omitted. Improvements in this are, despite continuing research, moving very slowly.

- The monetary values established reflect the current behaviour patterns of various groups in society and hence generally reflect current patterns of income distribution. Therefore the resulting sets of values may reinforce current patterns of inequality in society rather than redressing them.

- Pricing the quality of life involves ethical factors and concerns, which are typically very difficult to quantify.

### 330 *Multi Criteria Analysis*

MCA is a much broader appraisal approach that explicitly considers both monetary and non-monetary costs and benefits expressed in quantitative and qualitative terms. MCA is an appraisal framework used primarily where decision makers are required to openly address a range of quantitative *and* qualitative based criteria and values from which conclusions are derived that reflect these multiple judgements rather than having them all wound up in one concluding (monetized) figure. It is thus deemed more relevant to the use of project appraisal efforts that seek to assess infrastructure project contributions to sustainable development outcomes. It is also more conducive to facilitating the engagement of project sponsors and investors with other stakeholders, including community groups, in ways that can provide valuable inputs into project design and appraisal. MCA thus contrasts with the CBA approach quite significantly, although there is clear acknowledgement by advocates of MCA that CBA plays an important role within MCA

MCA is more commonly used for appraisal (and monitoring) processes that do *not* require a single monetary return or where such a measure is considered impossible or lacking in any useful validity. It is aimed at supporting decision makers who are faced with making numerous and conflicting evaluations that involve monetary *and* non-monetary assessments. It aims at highlighting conflicts of multiple goal pursuit and seeking compromise among choices in a *transparent* process. It is especially important for environmental and social assessments of projects, such as Environmental Impact Analysis (EIA), Social Impact Analysis (SIA) and Sustainability Appraisal (SA).

MCA offers a valuable discipline in ensuring that that non-quantifiable project appraisal concerns are included and assessed. It furthermore benefits considerably from having as much of the criteria quantified to the maximum extent *realistically* possible and even monetized where this may be done soundly, without ignoring those aspects that do not lend themselves to quantification or where efforts of quantification incur costs beyond what is affordable.

### 360 *Project appraisal trends and sectors*

Project appraisal methodologies have developed over time, in line with economic and social developments and have been influenced by passing phases of different schools of economic thought. Recent experiences in confronting international development challenges and the global credit crisis have more recently led toward a re-appraisal of the validity of the premise that all costs and benefits of project outcomes can be monetized and even quantified in proxy terms. This has led to a return to Keynesian welfare economic values. This follows a period of experimentation with increasingly unregulated neo-liberal approaches that place a higher value on the leadership offered by the market.

370 The last two decades have seen a growing international emphasis on project appraisal methodologies that seek to address aspects that are far wider than measurable aspects or the direct effects of projects.

This reflects the growing importance of a number of global challenges such as climate change; energy use; unequal health among countries and of communities; and rising levels of poverty, deprivation and inequity in certain areas of the world as reflected in the Millennium  
375 Global Development Goals (MDGs) (see above). These different perspectives, especially in the case of large scale infrastructure projects, can increase local opposition to such projects, especially those which bring major changes but *only* with ‘trickle-down effects’ to project non-users or benefits accruing to the infrastructure user more than non-user. These concerns have led to formal requirements, set out in many governments’ policy documents, to  
380 incorporate environmental impact studies into infrastructure plans and projects. Such circumstances require project appraisal approaches that more understand the context of the project and their multi-dimensional aims – a view now more readily acknowledged by international development agencies and government alike (17). Areas of concern that were in the past deemed to be external to the project are now recognised to need internalisation in the  
385 project’s appraisal process. This development makes MCA a more suitable framework for project appraisal than efforts solely based on CBA.

#### *Setting objectives for projects*

390 The Study’s investigation of the different methodologies used in the appraisal of major transport projects suggest that their different emphasis tend to be associated with the different foci of the professional groups involved. The more specifically numerate disciplines, such as economists, civil engineers and transport planners, primarily employ CBA methodologies. MCA methodologies, on the other hand, are generally employed and led by groups associated  
395 with the environment, society and urban and regional planning concerns.

Research of the OMEGA Centre and others involved in the critical review of decision making in the planning, appraisal and delivery of major infrastructure projects (18; 10; 19; 20) confirm that much project appraisal is essentially a political process because of the way it (the appraisal process) is situated within the overall project decision making context. Major  
400 projects, particularly in the developing world, are furthermore often seen as agents of change, with the result that their objectives focus on their performance in the wider community beyond achievements at generating economic growth. This is especially the case where the main project promoter is within the public sector. Even where the project is primarily promoted by the private sector, the project’s defined objectives typically address wider goals  
405 where these form the basis of market demand or affect areas where the promoter wishes to influence public support. Recognition of this tight relationship with government and other public agency processes is often not adequately made during major project development.

The right to set the project appraisal framework typically lies ultimately with the body providing the funding for the project. As already indicated, with mega projects there is likely  
410 to be a significant degree of involvement of bodies wholly or partly in the public sector: national and regional governments, and even international bodies, such as the European Union or World Bank. Some European countries, such as France, Germany and the Netherlands, as well as many developing countries, place great emphasis on national planning frameworks. Other countries, such as the UK and USA, place more emphasis on market-led  
415 strategies. Whatever the approach, if policy statements and strategies fail to identify particular aspects of environmental or social effect, then any project deriving its objectives

against them may well also fail to cover these aspects. In short, in such circumstances, what is left unsaid in policies is *not* likely to come on to the agenda.

420 What is very apparent is that ultimately, in any circumstance, the principal promoters' aims (sometimes vision) are likely to be crucial for any project. While these may well incorporate national policy statements, in practice the weight applied to these aims and visions through the appraisal process vary (and change over time) according to the relevance applied to them by key promoters. They may remain as external influences which are internalised *only* as far as is necessary. This is complicated by the fact that the key  
425 stakeholders who control the project appraisal overall can change over time, especially in the case of major infrastructure projects which typically have a lengthy period between conception and implementation.

### *Aims and structures of project appraisal methodologies*

430 All project appraisal methodologies have a firmly developed structure, usually setting out a series of steps within a defined overall planning process. This is likely to include break points, where the results reached by one stage of an appraisal are submitted to all stakeholders for consultation or to the decision makers for a decision on the next stage; or  
435 sometimes both.

Thus, for example, the EIA process can be represented as a series of iterative stages which *should* be a cyclical activity, with feedback from later stages to earlier ones. In fact, the EIA process may be defined as two stages based around the principal consent decision for a development proposal. The pre-decision stage incorporates the early stages of an EIA  
440 process (i.e. screening, scoping and impact prediction). The post decision stage, assuming consent has been granted, is the follow-up stage during various stages of the project life cycle (i.e. final design, construction, operation, and management). In the UK, however, post-auditing activities are not widespread and this limits the cyclical nature of the appraisal process (21).

445 A most important aspect in the evolution of EIAs was the fact that, through this exercise, developers would be required to consider alternative options. There are good reasons for this: an in-depth discussion of alternatives ensures that the developer has considered other approaches and of other ways of mitigating environmental damage. In the UK, the consideration of alternatives is given much less consideration than might have been  
450 anticipated (21). Yet option generation forms a vital part of project planning. Alternatives need to be developed, in outline at least, and discussed, so that they provide the basis for a project design that that is already starting to address potential impacts.

The UK *New Approach to Transport Appraisal* (NATA) process for appraising transport plans and projects is made up of 15 steps, see TAG Unit 1.1 (22). The process  
455 commences with setting the objectives and leads up to completion of the Appraisal Summary Table (AST), which is used to assess the achievement of the government's transport objectives, broken down into a number of sub-objectives. The main impacts in relation to each of the sub-objectives are summarized in text form together with any relevant quantified information. A summary assessment is then provided in order to indicate whether the impact  
460 in each category is generally beneficial or adverse and how large it is. Where monetary values can be derived - as in the case of accidents or transport economic efficiency - the summary assessment uses those values. Where impacts can be quantified but *not* monetized, the summary assessment is quantitative. Impacts that cannot be quantified are assessed on a (usually) seven point scale (these scales are not necessarily cardinal in nature and the scales  
465 for different objectives are not comparable with each other). Assessment of the extent to

which the problems identified would be solved by the option or options proposed then needs to be made, considering both absolute and relative performance against key indicators. (Hine, 2009). Doubts exist, however, over the emphasis on the monetized economic result normally found in NATA appraisals.

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#### *Range of criteria, indicators and information*

The ranges of criteria and indicators which may be used in a project appraisal are determined by a number of factors considered together. These include:

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- *the decision making bodies*, including promoters and funders, and what they need to identify;

- *the objectives for the project*, which may include the objectives for the planning context within which the project is being developed;

- *the professional basis and purpose*;

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- *the statutory requirements*; and

- *conventionally accepted items*.

The choice of indicators and the level of information used may well be influenced by the availability of data, the cost of obtaining it and the extent to which it is judged valid. There are statutory requirements within some fields but these do not necessarily lead to high quality information being generated where this is difficult to achieve.

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As an example of the approach in the transport sector, projects appraised by the NATA systems should all be set against the five key objectives defined in the 2008 White Paper *Delivering a Sustainable Transport System (DaSTS)* (23). (Previously they were set against five objectives in the 1998 White Paper entitled *A New Deal for Transport*.) For each of these objectives several indicators are required. But the results of these are then aggregated to provide an *apparently* easier guidance for decisions. However, the more that data is aggregated, the higher quality it needs to be in principle, in order to still be meaningful. Under any circumstances, aggregation means compounding, thus any lack of validity may be increased significantly.

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Equally crucial is the issue of quantitative (data) as against qualitative (descriptive) information in indicators. Quantitative measures can provide in principle a sound basis for comparison whereas qualitative measures do not offer such hard references. On the other hand, a single set of numerical data – or even just one summary figure – leaves open concerns over how it was calculated – the ‘black box’ issue. All information sets raise questions of subjectivity, value assessments and stakeholder bias. In consequence there is little benefit in implementing a comprehensive system of environmental or social assessment if no check is made on the validity and impartiality of the data presented to the decision makers.

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#### *Project scoping and consultation*

The scoping stage is arguably the most important of the appraisal process for a project. This stage establishes the context, the objectives and the availability of information of the project. It also offers a key opportunity for developing options for consideration *before* appraisal starts on one particular option. Yet, it remains a poorly understood and under-researched component. There is typically a lack of sufficient consideration of alternative options, of cumulative impacts, and of project monitoring and auditing tasks.

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It is particularly important to give adequate attention to the choice and outline design of the project. Too often a project comes forward and is appraised *without* any clear concept

515 of whether, in the context it is the most suitable project to address the issues requiring a solution, or whether the appraisal framework and inputs are the most appropriate to provide a sound judgment on the project's true value.

Research from the OMEGA Centre has also shown that public consultation in major project infrastructure appraisal (for mega urban transport projects in particular) is sporadic and limited, even though it is *supposed* to occur at every stage of the process (3). Consultation with project stakeholders is a required part of the project planning and appraisal processes of major infrastructure projects at local, national *and* international levels. Indeed 92% of the OMEGA RAMP survey respondents supported the premise that the engagement of all stakeholders in the project appraisal process is essential, two thirds unconditionally. The processes for carrying it out, however, are *not* always clearly defined and vary widely. It is suggested (16) that there are two broad approaches to public involvement: consultative and participatory:

- *The consultative approach:* This meets the basic requirements of consultation with the public *but* falls short of providing participation of the public or all stakeholders in the project decision-making process. The public and stakeholders may be consulted at various points throughout a public process but are *not* involved directly in developing the material or assessing the effects, or in project decision making.

- *The participatory approach:* This more innovative but more challenging approach allows project stakeholders to participate in the project decision-making much more directly. The move to truly participatory forms of appraisal is not easy because it requires a shift in values, which allows for a more open, honest and transparent relationship to develop among all parties. It requires a shift in the way power is shared, as well as time, resources, and commitment by all parties, including the public and stakeholders. Additionally, there is frequently a tension between the requirements of public involvement in the project appraisal process and the increasing seemingly sophisticated and complex methodologies involved in CBA, MCA and modelling approaches used by professionals.

Promoters of major infrastructure projects often fail to develop 'real' alternatives, i.e. options that are radically different from each other. Too often, the appraisal gives decision makers the simple option of approving the project or of accepting a 'do-nothing' (or sometimes 'do-minimum') situation; there is no scope here for considering a wider range of actions. Yet formulating alternative scenarios for assessment can play a vital role in the ultimate outcomes of project appraisal (24). According to Hartley (25), these may cover broad outline options, at an early stage of project development: in effect defining whether there might be a project and what it is. At a later stage in the process they can be developed and tested to cover different aspects: specific type and scale of project, route alignment, charging regime.

#### *Environmental and social factors*

555 Incorporating the environmental and social factors of sustainability within a major infrastructure project requires an approach to appraisal that offers a broader and clearer understanding of the multiplicity of key decision-making factors. This should go well beyond economic concerns and market imperatives, particularly for public sector projects. This was supported by 63% of OMEGA RAMP survey respondents who agreed fully or conditionally with the premise that firm objectives and visions for projects are seen as important. Such an approach, as in the case of Multi Criteria Analysis, should reflect the project's policy context and directives in project objectives and allow for the full engagement of key stakeholders as

565 early in the project lifecycle as possible. The aim should be to contribute positively to sustainable development, not just to mitigate negative impacts or avoid difficult decisions

### **Study Recommendation - Using Multi-Criteria Analysis in project appraisal and in the RAMP process**

570 The Study concludes with the recommendation that Multi Criteria Analysis (MCA) provides a suitable framework for presenting and assessing the relevant factors of sustainable development of major infrastructure appraisal as a basis for decision-making. Indeed 76% of OMEGA RAMP survey respondents confirmed that project appraisal could more effectively employ MCA rather than CBA alone.

575 MCA offers a framework and methodology for determining overall preferences amongst a series of project alternatives where each accomplishes a series of objectives. Objectives are assessed using indicators which comprise both quantitative and qualitative information, thus addressing all aspects of the situation. In this way MCA provides a framework of techniques for comparing and ranking different alternatives, using a variety of indicator types, side-by-side.

580 Most importantly, the framework can be successfully integrated with risk management frameworks such as the RAMP process. This process enables identification and management of project risks at different stages in a project lifecycle, enables financial values to be placed on them, and facilitates mitigation and control. The MCA framework allows these to be achieved from a multiple stakeholder perspective.

585 The Study also recommends that the framework should be used within an approach based on a sustainable business case for the proposed project. This should aim not merely to mitigate negative impacts but to contribute positively to all dimensions of sustainable development. This includes the appraisal and management of environmental and social risks.

590 The recommended MCA framework offers the following advantages:

- **A systematic framework:** The approach offers a systematic framework for making trade-off assessments between predicted costs and benefits. It offers a powerful approach for project appraisal that clarifies which project criteria should have priority, under which set of circumstances, for which stakeholder.
- 595 • **An effective treatment of quantifiable and non-quantifiable factors:** Where project factors and criteria can be quantified and monetised reliably, the MCA framework presents these side-by-side with qualitative and non-monetised factors. This illustrates their contributions to overall project visions, policies and objectives. It ensures that no important factor is omitted from the appraisal simply because quantification is not practical.
- 600 • **A framework for making structured trade-offs:** the MCA framework offers scope for addressing a range of project objectives and risks in a structured way, allowing clear identification of issues and possible outcomes of alternative actions. This is invaluable in trade-off assessments between their costs and benefits. The results of financial appraisals and (Social) CBA appraisals, so important for particular key investors and project sponsors, feature significantly within this decision matrix. They are assigned the appropriate priority in the context of overall policy priorities and against goals of sustainable development across all its dimensions.
- 605 • **The employment of sound objectives:** The framework allows the identification of sound objectives which go beyond concern with purely financial market fundamentals and reflect established policy objectives that surround the project – local, national, international. These include the objectives for environmental and social factors of sustainability, especially if ratified by international directives or targets.
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- 615 • **The promotion of stakeholder participation:** The framework supports sound project development and design principles because it is grounded on the effective involvement of all project stakeholders, not only its sponsors and supporters.
- 620 • **Engagement throughout the project lifecycle:** The framework allows adequate time and attention to be paid to the engagement of stakeholders in the successive stages of the appraisal process, so that they can be involved from the project inception phase. This allows significant issues and information to be brought out over different project stages. It facilitates understanding of the importance of the various group priorities and how these relate to objectives and risks.
- 625 • **Social and environmental risk:** The framework finally offers a basis for weighting appraisal criteria and for seeking trade-offs in moving towards decisions while effectively involving all project stakeholders. A process of this kind provides invaluable guidance in the choice and design of the project and in the treatment of social and environmental risks of sustainable development. Failure to approach the project's development in this way can mean a failure to reflect key issues in decision-making and thus may generate increased risks of delay and loss.

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690