BARTLETT SCHOOL OF PLANNING

Incorporating Principles of Sustainable Development within the Design and Delivery of Major Projects: An international study with particular reference to Mega Urban Transport Projects for the Institution of Civil Engineers and the Actuarial Profession

Draft chapter for RAMP handbook

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Centre for Mega Projects in Transport and Development

A global Centre of Excellence in Future Urban Transport sponsored by Volvo Research and Educational Foundations (VREF)

1.0 Introduction

1.1 Principles of sustainable development

This chapter considers the issues raised by the increasing focus on sustainable development. It particularly addresses how the environmental and social dimensions of sustainability should be brought into project development and appraisal. It sets out an approach for appraising and managing them within the RAMP process.

The concept of sustainable development has emerged as a major feature of discussion and of public policy in recent decades, especially over the last twenty years. This reflects growing awareness and increasing concerns over global issues, notably the possible impacts of climate change, emerging depletion of world energy supplies and grave disparities between the quality of life experienced by different populations. Sustainable development now forms a crucial part of many policy documents, especially those of public authorities: international agencies, national governments, regional and local authorities. A growing number of commercial organisations also include sustainability in their business strategies and are seeking to reflect the principle in their operations and projects.

Sustainability is often seen primarily in terms of the environment, and sometimes also social concerns. But truly sustainable development requires integrated advance in economic, environmental, and social terms, and in the institutional structures that support this. Thus economic success should be assessed within a sustainable framework rather than as an end in itself. Focusing on economic growth measured in current terms may prevent both present and future externalities being addressed; but external effects can constrain growth (peak oil may turn out to be a particular example). Thus sustainable development actions must be seen to advance the quality of life in all respects, as a fundamental part of sustainable economic growth, rather than merely mitigating potentially negative aspects in particular fields.

Sustainable development has been most simply defined by the Brundtland Report (1987), which states: "*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* However, the visions for sustainability set out in international definitions and agreements are often couched as broadly based policies without clearly defined methodologies for putting them into practice. To be effective, it is essential to translate the sustainability concept into operational terms and to incorporate relevant goals in appraisal processes. This chapter seeks to do so within the RAMP guidelines.

Evidence is merging world-wide that the cost of failing to do this can be very high indeed. Largely these costs reflect failures to properly identify, assess and manage environmental and social risks. This chapter reviews this crucial aspect of risk assessment and management, considers its relationship to project appraisal and sets out a recommended framework for addressing the issues effectively.

1.2 Sustainable development in infrastructure projects

Sustainable development particularly affects major infrastructure projects. Because of their scale and nature, these projects have widespread impact on communities in both human and physical terms and may be affected by them, for three main reasons:

- Infrastructure usually has a significant impact in environmental and social terms. The rationale for infrastructure investments is typically to produce major societal benefits. Assessing this requires a very complex calculation of costs and benefits. Because of the complexity of social and environmental 'systems', the calculation is inherently related to the consideration of environmental and social risks and opportunities.
- In addition, infrastructure developments will almost always produce winners and losers, so an additional equity concern further complicates the assessment of costs and benefits. This is a particularly acute challenge when the losers are the poor (as is so often the case in both the developing and developed world).
- Infrastructure typically has a very long lifespan, so the consequences of projects are significant through time. This is for example now a critical issue for UK energy infrastructure: the government is trying to balance short term energy security and affordability while trying to simultaneously avoid 'lock in' of high-carbon energy generation for the next 30-40 years.

So the environmental and social dimensions of sustainable development and the risks inherent in them need to be addressed in the development and appraisal of such projects, on an integral basis with the economic and financial considerations. They form potential risks with potentially severe economic and financial implications and these must be managed throughout all stages of a project's life cycle. They may, however, also offer previously unseen opportunities for the project. Yet identifying some of these factors and risks, let alone preparing sound forecasts, can prove especially difficult. For those of a more intangible nature measurement can become questionable.

1.3 The OMEGA Centre RAMP Study

To gain a better understanding of how to treat the risks from the environmental and social aspects of sustainable development, the RAMP Committee engaged the Omega Centre[1] at University College London (UCL) to carry out research on this subject and provide recommendations[2]. The UCL study objectives covered:

- assessment of current practices for addressing social and environmental considerations of sustainability in major project appraisal;

[1] www.omegacentre.bartlett.ucl.ac

[2] This work has been partially supported by a Volvo Research and Education Foundation (VREF) Centre of Excellence (CoE) Grant awarded to the OMEGA Centre to fund its research into the planning, appraisal and delivery of Mega Urban Transport Projects.

- recommendations of a 'good practice'[3] appraisal framework setting financial and economic returns against social and environmental risks and opportunities;
- examining the applicability of the RAMP principles to this framework; and
- seeking to express social and environmental (as well as institutional) considerations and risks in financial terms (as far as possible), for their inclusion in investment models.

The study programme included: review of relevant research literature; interview surveys among key decision makers and professionals in the UK and overseas; analysis of this material together with emerging findings from the Centre's international research; and a seminar to gain the views of influential practitioners. From this work the study identified several key issues with significant implications for addressing environmental and social risks in project development and appraisal, and set out recommendations for identifying, assessing and managing them. A full picture of the work programme and findings appears in the Study's *Final Report* (Omega Centre, 2010).

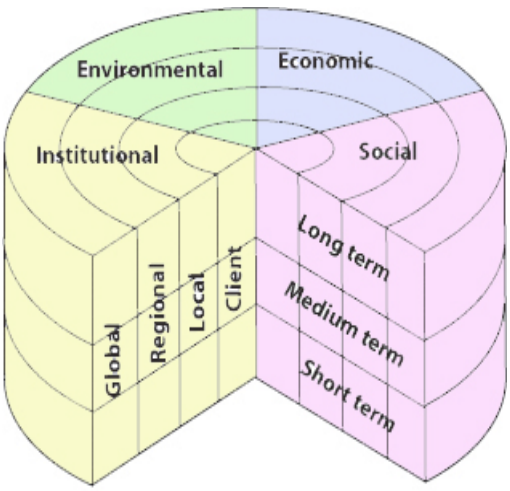
[3] 'Good practice' avoids the use of the term 'best practice'. This can lead to insensitivity to varying circumstances, through applying standard a templates of professional practice irrespective of context. 'Good practice' offers generic lessons that take account of different contextual circumstances.

2.0 Incorporating environmental and social factors into projects

2.1 Sustainable development factors: the HalSTAR model

Sustainable development is traditionally seen to involve three principal sets of factors: economic, environmental and social. These are often seen as complementary yet conflicting. In addition there is now a growing recognition that institutional factors also play a crucial role and should be considered a fourth set of factors (Dimitriou and Thompson, 2001). The context in which these four sets of factors interplay has been particularly illustrated by the HalSTAR Systems Model developed by Halcrow (Pearce, 2008). It brings out three key dimensions of sustainability: the notion of 'capitals', i.e. the major fields of human activity; the varying geographic scales, from international to local, on which sustainability is considered; and the temporal dimension. The Study team has, with Halcrow's agreement, adapted this to reflect economic, environmental, social and institutional dimensions of sustainability – Figure 1.

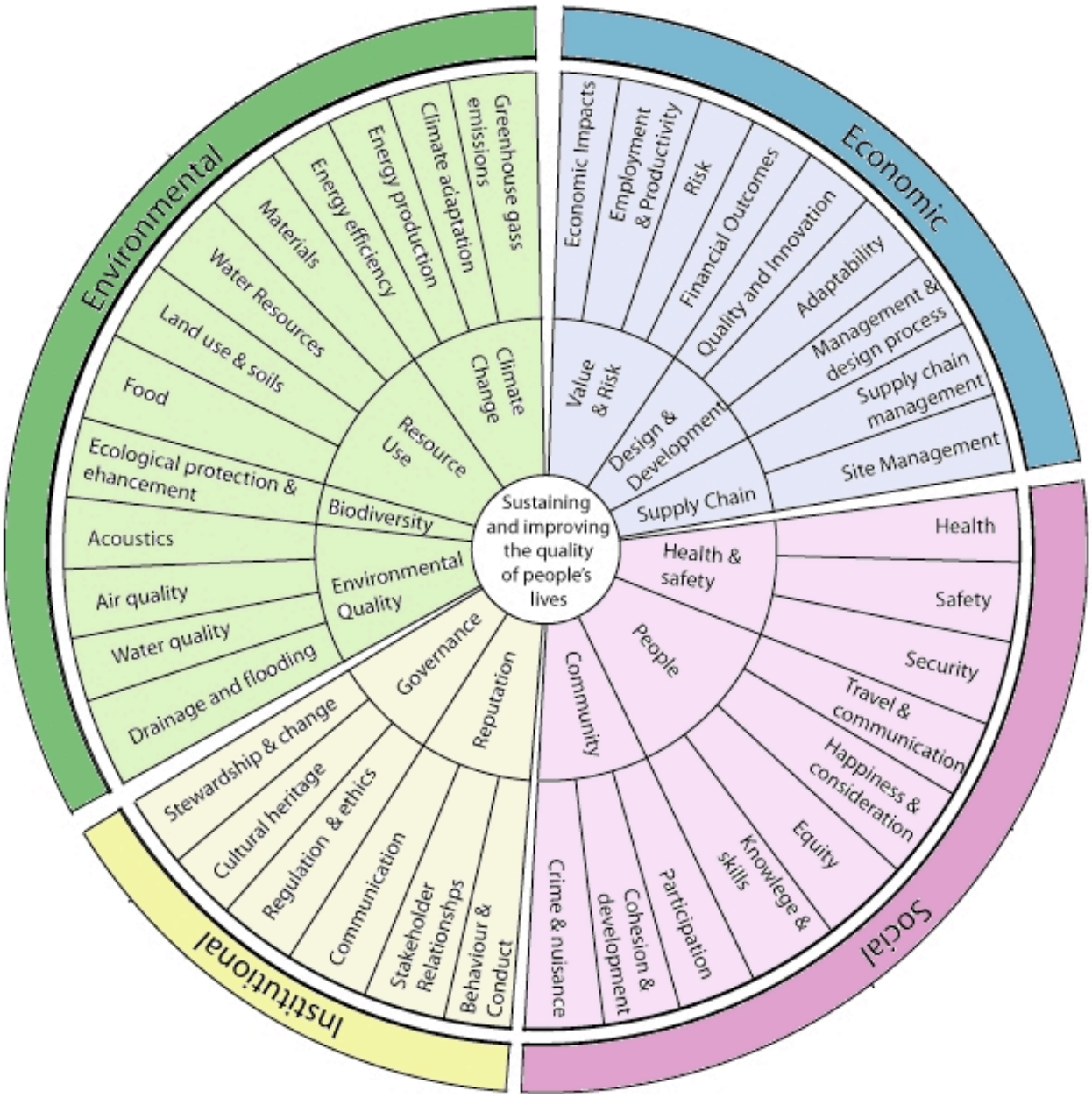
Figure 1: OMEGA Centre Adaptation of HalSTAR Systems Model of Sustainability



[Source: OMEGA Centre UCL (2010) – adapted from Pearce (2008)]

Central to the HalSTAR model analysis is its sustainability wheel. This provides a generic framework of sustainability criteria derived from the definitions reviewed in over 400 existing approaches to sustainability. The HalSTAR approach affords a clear picture of the multiple criteria mostly associated with assessing progress toward achieving sustainability; it enables conflicts and trade-offs to be drawn out more easily, thus facilitating transparency in decision making. The sustainability wheel has also been modified (Figure 2) to highlight the four (rather than three dimensions) of sustainability.

Figure 2: OMEGA Centre's Adaptation of HalSTAR Sustainability Wheel



[Source: OMEGA Centre, UCL (2010) – adapted from Pearce (2008)]

2.2 Environmental and social factors and risks

Environmental and social factors of project development and appraisal and their associated risks, the focus of this chapter, may be described in the following terms. (Appendix 3 lists and defines the main groups of factors.)

Environmental factors 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.

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 in project appraisal. In part this is because they 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 the UN Milleneaum Development Goals, and is a key objective of international funding agencies such as the World Bank.

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 (Millennium Ecosystems Assessment, 2005); this is regularly highlighted by news reports of catastrophes and failures across the world). At a specific level, attributes such as heritage have physical form but involve human (social) judgement (e.g. construction of a new road or rail line might impact on a deeply valued natural feature or building in ways considered highly destructive by some communities, i.e. those who live there, but relatively unimportant by others, i.e. those travelling through the area).

Environmental and social factors form key risks for any project; and also key opportunities. 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:

- 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 re-routeing 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.

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 ancient building? What extra capital might be justified to avoid demolishing it? Or to leave it undisturbed? Such examples may prove very difficult to handle. 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.

2.3 The sustainable business case and institutional stability

If a project is to be truly sustainable, the business case for it should be conceived in sustainable terms, i.e. as a 'sustainable business case'. This should generate both short and long term gains to the initial investors, with mid term goals that strategically link the two, while avoiding long run costs being left to other project partners in later generations. The approach must reflect several key issues:

- The primary responsibility for leading on sustainability in practice lies with public authorities. Their broader objectives may well conflict with the financial aims of commercial operating bodies. But commercial investors need to demonstrate a return on funds invested in order to attract finance for projects.
- In principle companies can go some way beyond the requirements of current policies and regulations, e.g. through aiming to reach to higher standards. This may demonstrate long sightedness and hence gain more investment. But they need to judge what non-quantifiable benefits are worth to the balance sheet.
- Strategic business assessments must take account of timescales. Potential goals, including those in environmental and social fields, can be moving targets. Standards could be raised unexpectedly, or expected raises might not take place. Any large project will take considerable time from its conception through to implementation. Over this time scale the sponsors themselves might change and their aims could change to reflect different priorities.
- Companies should identify risk and opportunity at a strategic level as well as for projects. This should cover sustainability factors as well as other aspects. A company which adopted sustainable development goals should carry them through into its projects as well as its operations.
- In a long-term project many important uncertainties will remain, even after extensive analysis, and it will often be worth considering at the design stage whether it is worth spending extra capital in order to make the project more robust and flexible, and hence better able to meet successfully the unforeseeable challenges of the future.

- How far should projects be aimed at positively improving environmental and social conditions promoting sustainable development rather than just mitigating negative impacts?

Institutional stability also plays a crucial role, especially in major projects. To ensure successful delivery, such projects need institutional structures and processes that can function effectively throughout, sharing visions of sustainability as they develop, in terms of goals and structures and ensuring sustainable flows of resources over time. These include the administrative and legal systems through which government develops and implements policy, the operational capacity and approach of public and private organizations at all levels, and the effectiveness with which they engage together.

2.4 Engaging stakeholders

The basis on which a project is finally chosen and its boundaries defined is itself crucial and forms an opportunity to either introduce or mitigate project risk, as defined by the OMEGA project. Infrastructure is organic and needs to be treated as such, not as a fixed system (Dimitriou et al, 2010). A narrow view of projects within their own field (e.g. transport) or as closed systems, or both, may limit the amount of thought given to different possible schemes. If consideration is given to the wider context within which projects for improvement are being sought and the issues which need to be addressed, then a range of possible schemes may be generated, not necessarily all in the same field. This requires early assessment of the issues and potential risks.

Early engagement of all stakeholders is a key to enabling the scope and nature of all significant issues to be identified. This calls for open dialogue between expert and non-expert stakeholders. It can, however, generate clashes between the more linear thinking employed by many professionals and more lateral thinking by politicians and community representatives. Furthermore, there will almost certainly be widely differing perspectives for different groups. So it can be painful for promoters and other sponsoring bodies, as it can create considerable tension. But constant engagement through an open approach to stakeholders based on trust and mutual understanding can play an important role in establishing the priorities and values of different groups. It may ultimately help in the identification of more optimal solutions.

These priorities and values may then be incorporated into the processes of project development and appraisal. They also provide valuable indications of potential risks in terms of identifying environmental and social factors. This may well aid in deciding individual risk mitigation strategies. The process of stakeholder engagement can produce useful compromise agreements (often seen as sub-optimal solutions for some but pragmatic progress for others).

3.0 Appraisal methodologies for major projects – the role of MCA

3.1 Appraising major projects – the principal methodologies

To address economic, environmental, social and institutional factors if project development and appraisal together in a sustainable way, it is essential to understand and manage the tensions, contradictions and potential trade-offs between them. A major project may involve finding solutions to problems in several different fields. Understanding these, bringing the relevant parties on board and appraising the multiple effects are very complex tasks. Changing contexts furthermore can affect the nature and pace of development, the effectiveness of project planning and management, and the understanding of risks.

Appraisal processes for major infrastructure projects continue to evolve in form and coverage, supported by research programmes to develop their effectiveness for decision making. To date efforts to address these tensions within project development and appraisal are taking place at a rather slow and piecemeal pace. Growing evidence indicates that current methodologies do not adequately address current sustainability challenges, because of serious issues of complexity and context common to most forms of project appraisal (Dimitriou et al, 2010).

There exists a range of methodologies for project appraisal but for the purposes of this study they can ultimately be identified within three main categories:

- Financial Cost Benefit Analysis (CBA) assesses the projected flows of cash for the project: capital spending, operational costs and revenues. It includes only directly attributable expenditures and incomes. From these it calculates the overall rate of return as a single figure, usually as a Net Present Value (NPV).
- Social Cost Benefit Analysis (CBA) also involves assessment of projected cash flows. But in addition it incorporates attributed monetary values for non-monetary items, to reflect economic, environmental and social factors which do not have an identifiable effect on the project's costs and incomes. It too calculates the overall rate of return to measure the project, usually Benefit:Cost Ratio (BCR) (this may be used together with other measures).
- Multi Criteria Analysis (MCA) is a much broader appraisal framework that explicitly considers all factors in terms of both monetary and non-monetary costs and benefits, expressed in quantitative and qualitative terms. The results for each factor are presented in a summary table setting out all the criteria identified for assessment. An MCA framework is valuable as a basis for identifying the concerns and priorities of different stakeholder groups, bringing these into the assessment, often enabling more transparent trade-offs between priorities. It should also accommodate Financial CBA and Social CBA appraisals within its framework.

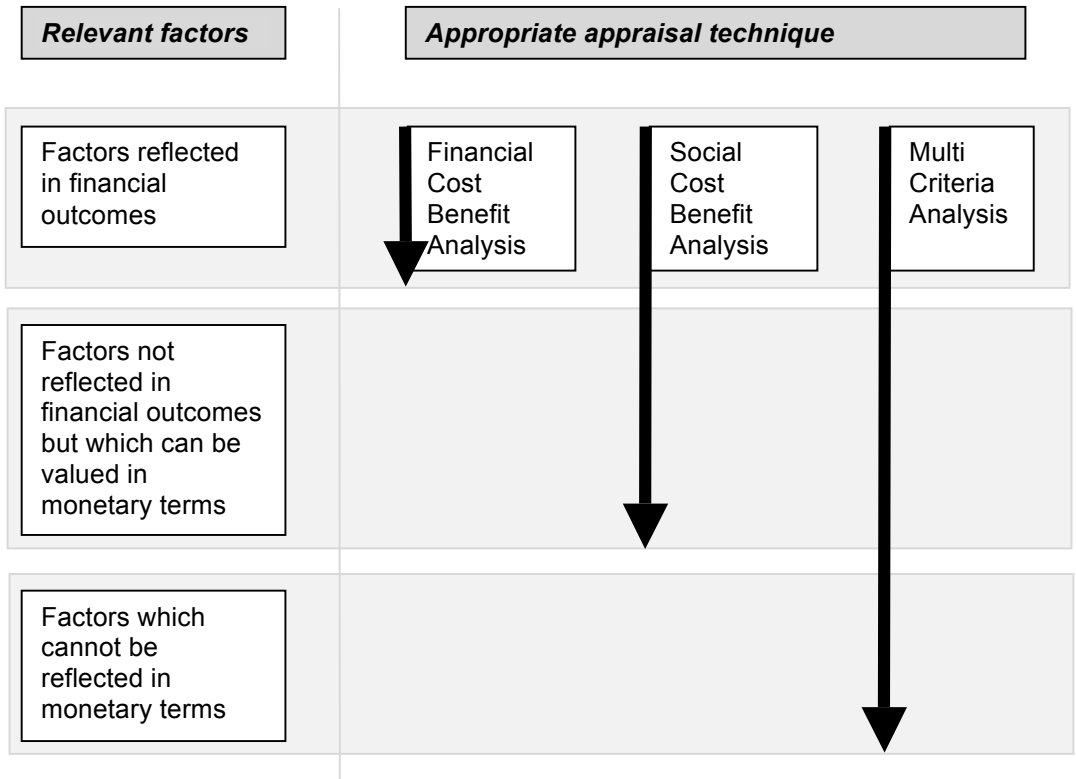
The factors that can be included in project appraisals fall into three broad categories:

- those that are reflected in monetary outcomes,
- those that are not reflected in monetary outcomes but for which a monetary value can be established, and

- those for which a monetary value cannot be established.

The relationships between these groups of factors and the three types of appraisal are set out in Figure 3.

Figure 3: Sustainability factors and project appraisal techniques



Often the main appraisal activity is focused from the start on one project, which is then developed in considerable detail. However, this approach may well miss out on risks and opportunities which might emerge at an early stage of the project's development. To avoid this, it is essential that the total situation is considered from a very early stage and that the potential for a project to address the key issues is developed through preparation of alternative scenarios. Initial appraisal of options within these can help to produce a final project which is more soundly developed.

3.2 The role and use of Financial CBA

Financial CBA is a common form of financial assessment, used for most major projects. Many projects receive at least part of their funding from private sector companies, and in some cases most of the financing comes from such sources. Investors will only proceed if they judge that the identifiable return on their investment is worthwhile. Therefore the appraisal of the financial results is crucial to

securing project finance from such investment sources, whether or not public funds are also involved.

To establish the value of the investment, project investors are likely to specify the Net Present Value (NPV) they wish to achieve with their funds and will invest in a project only if it is projected to achieve at least that figure. (This will usually include allowance for identified possible risks.) The NPV in investment terms incorporates the forecast flows of cash for construction and operation – expenditure and revenues. A Financial CBA will not, however, include monetized environmental and social factors which do not directly contribute to cost and income streams.

While Financial CBA is normally used by private sector investors, public sector bodies may on occasions also prepare a Financial CBA where they have a commercial interest in a project.

3.3 The role and use of Social CBA

Social CBA follows the same process of assessing flows of costs and gains through a project's life: but it differs significantly from Financial CBA in that these streams of money include both actual cash and also monetized values for environmental and social factors. It forms the principal basis for most public sector project appraisal, particularly for infrastructure developments, which are mostly driven by public sector strategies. Such projects normally involve funding, in part at least, by public sector capital funds. While these are not usually expected to yield commercial returns, the investing authorities must demonstrate a return on its investment on a disciplined basis. The scale of return on project investments usually has to be measured against other projects in the same field and from projects in other fields. Governments may well specify an investment target figure which projects must achieve if they are to be implemented, e.g. BCR.

Commercial bodies may also prepare a Social CBA where they wish to consider environmental and social factors within a monetized structure. To prepare a Social CBA factors judged relevant are monetized and brought together to identify a rate of return for the project. This requires the establishment of prices and costs for all factors: i.e. monetization. There are various techniques for this, including:

- the creation of surrogate markets, where market prices are used as an indirect reflection of impacts (e.g. the cost of insurance against a possible event),
- basing spending decisions on revealed behaviour, derived from analysis of actual spending patterns (e.g. higher payments for quicker travel indicating their value of time), and
- basing spending decisions on stated preferences derived from an analysis of people's responses to questions about spending in hypothetical situations.

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 leaves open concerns over how it was calculated: the 'black box' issue.

- 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.

Many practitioners remain confident that (Social) CBA techniques offer sound identification of the scales of values for various factors; some consider that everything may be measured. But, despite continuing research, difficulties remain in converting some factors to acceptable monetary values (as shown by the wide variations in ascribed values between different countries – see the HEATCO Final Report, IER, 2006). Furthermore, some practitioners argue that monetary values are mostly of dubious validity for providing sound guidance on impacts. In this context, MCA is recognised to provide a framework which brings together all relevant factors and facilitates trade-offs of costs and benefits, both monetized and non-monetized.

3.4 The role and use of MCA

To reflect all social and environmental factors of sustainable development, whether readily monetizable or not, requires a project appraisal framework which

- supports decision making based on a range of different values;
- is structured to capture the different priorities of multiple stakeholder groups; and
- continues to reflect changing information and priorities throughout the project life cycle.

This implies use of some form of Multi Criteria Analysis (MCA) to cover all factors, rather than an exclusive use of Social CBA alone. MCA methodologies enable each factor to be presented within a summary table which sets out all the criteria identified by policies and plans relevant to the project for assessment.

The MCA framework provides to project managers, and planners and policy makers, an invaluable structure for the holistic appraisal and management of sustainable development goals and visions of a major project throughout its life cycle. (Stirling, 2006)

- It can accommodate the Financial CBA, and the Social CBA that are essential for some stakeholders.

- It enables the development and appraisal of various scenarios and the outline appraisal of initial project proposals.
- It potentially allows all relevant factors to be identified, with quantified and non-quantified indicators presented together in a single table, giving decision makers a more complete picture of a project's potential implications.
- It enables clear identification of environmental and social risks (and opportunities) in context, so that they may be addressed at various stages of the project and from different stakeholder perspectives and for making trade-offs.
- It enables decision makers to openly address a range of quantitative and qualitative based criteria and values (as judged appropriate), including those of various stakeholder groups, and to derive conclusions from these.
- It provides transparency: when applied diligently, the MCA structure enables the tradeoffs between criteria to be recorded during the decision making process, thus fostering accountability.
- It helps to facilitate 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.
- It draws out stakeholders' priorities and values and thus focuses the main risks and ways to mitigate them.

MCA forms the methodology for formal assessments of projects in terms of environmental and social impact, such as Environmental Impact Analysis (EIA), Social Impact Analysis (SIA) and Sustainability Appraisal (SA). Unfortunately these often remain as separate processes which do not actually affect project design and implementation where this is focussed through Social CBA. This inefficient use of resources would be removed if all appraisals were brought within one MCA framework. The Department for Communities and Local Government encourages the use of MCA, which it describes in its manual for the MCA process (DCLG, 2009) as an "… increasingly popular set of techniques [which] typically combines a range of project, policy or programme option impacts into a single framework for easier assimilation by decision makers." and which "... complements guidance on those techniques which primarily use monetary valuations ..."

Several key aspects must be considered in using MCA as a framework for project appraisal and for identifying and managing the associated risks:

- Context matters: it is important to establish clearly the context for a project in relation to sustainable development and to set the appraisal boundaries.
- Project boundaries: it is essential that the physical, economic and social boundaries of a project be established from the outset.
- Judgement: a degree of judgement must always be employed when using MCA for classification, determining priorities or selecting among alternatives.
- Engagement of all interested parties: the MCA approach allows dialogue between all interested parties and should encourage thinking and focus trade-offs, between groups and between priorities.
- Disciplined use of analysis and measurement: the MCA approach requires quantification of factors as far as this may usefully be employed.

- Key role of national policy: weightings for MCA objectives should be informed by environmental and social policy at the national level where possible. But alternative weightings should also be assessed as necessary in relation to the context, especially where determined through stakeholder engagement.
- Early application of MCA: early application of MCA within the project life cycle is important, because it aids the decision making process by helping to improve the understanding of the problems and opportunities.

3.5 Producing values for project appraisal and risk assessment within MCA

The range of assessment criteria and indicators required in the MCA approach should be soundly measured so far as possible. The process of establishing them should ensure that every factor, whether quantifiable or not, is properly addressed. Their selection is determined by several factors, including:

- the decision making bodies, including promoters and funders, and what they need to identify;
- the objectives for the project, which may reflect the planning context within which the project is being developed;
- the professional basis and purpose;
- the statutory requirements; and
- conventionally accepted items.

In any project the principal promoters' aims are likely to play a major part. These may also reflect national policy objectives. But criteria and indicators must also reflect the various stakeholders' views. A key principle of the MCA framework is that it enables different weightings to be drawn out for consideration by different stakeholders and for the agreed ones to be arrived at through consensus so far as possible.

The choice of indicators and the level of information used will be influenced by the availability of data and the cost of obtaining it. Wherever possible, quantitative measures should be used, as these can provide a good basis for comparison. All assessment, quantitative and qualitative measures alike, should be approached with discipline. All information sets raise questions of subjectivity, value assessments and stakeholder bias. So it is essential that any appraisal process employed includes visible checking of the validity and impartiality of the data used. Where quantification is used, the figures employed should be sound rather than precise: spurious accuracy can bring too close a focus on the figures - what gets measured gets done.

All information can be of variable quality depending on the sources from which it is derived, the resources available to compile it and the context for the project's developments. Environmental assessment has been of growing importance for many years and much of it is increasingly quantifiable; especially scientific data on purely physical facts. Information on social factors, however, is far weaker, because these implicitly concern more political fields. Social assessment has lagged behind environmental assessment in formal appraisals. Compiling sound information takes time and can be costly. But there can be grave risks to the project if environmental

and social factors are not properly assessed; especially if this loses the support of key stakeholder groups who consider such factors very important.

For risk assessment and management as incorporated within the RAMP process, certain stakeholder groups require monetary values to be derived for all factors identified as posing a potential risk – especially investors. This introduces serious problems: monetized figures for many – perhaps most – environmental and social factors can be produced only with very broad assumptions and considerably uncertainty (as outlined in 3.3.above). If, however, the MCA framework is used to offer a disciplined and transparent basis for project appraisal and risk identification, then the resulting risk assessment figures can be used with much greater clarity and understanding.

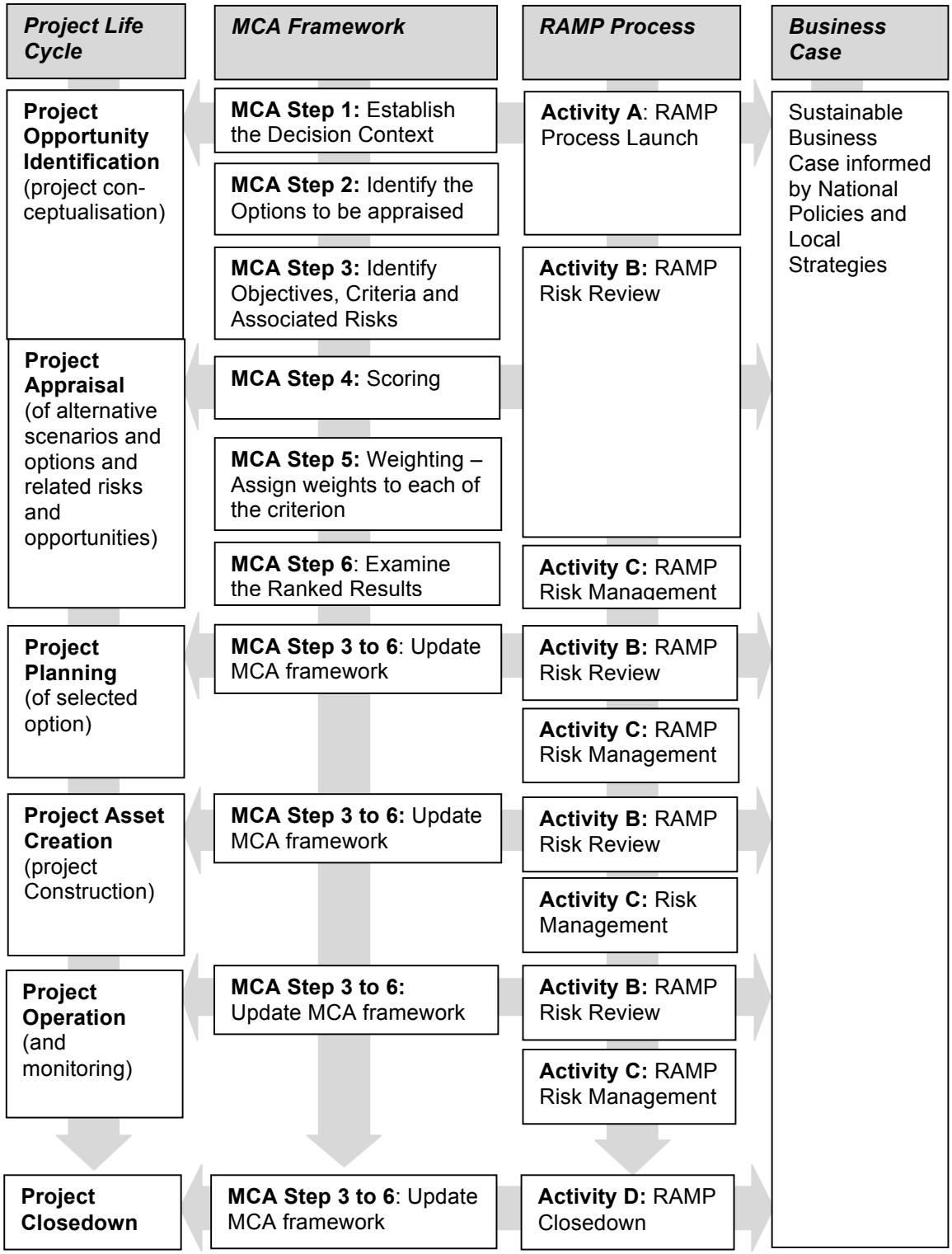
4.0 Assessing and managing risks through an MCA framework

4.1 Background

This section outlines a methodology for applying the MCA framework to decision making throughout the project life cycle in the context of the RAMP process. It is based on the work of the OMEGA Centre, with particular reference to the principles illustrated by the HalSTAR model, as cited earlier. The methodology emphasizes the identification, appraisal and management of key project risks relevant to the environmental and social dimensions of sustainability. The risks and potential mitigations are identified within each of the four themes of sustainability, presenting key inputs to RAMP Activity B (the Risk Review Stage) and RAMP Activity C (Risk Management) at various stages of the project life cycle. Figure 4 shows how this is applied.

The full methodology for using this approach and the framework is set out in Appendix 1. The following paragraphs summarise them. Appendix 2 offers a hypothetical worked example of the MCA framework in practice.

Figure 4: Interaction of MCA framework and RAMP Process within the Project Life Cycle



4.2 The main MCA steps for RAMP

Step 1: Establishing the decision context

Establishing the context and boundaries for the project forms a crucial early stage of the project development process for all stakeholders involved. Without a full understanding of these, costly and perhaps disastrous failures can occur. This task can be broken down into three sub-steps, outlined below. This process will also contribute strongly to RAMP Activity A (The Process Launch), where the preliminary objectives, scope and timing of the investment are considered in conjunction with the formation of the RAMP baseline which forms the context and basis for the risk analysis.

Sub-step 1.1: Establish the project Steering Group and the aims of MCA framework

The MCA framework and the analytical process it employs should be driven by a project Steering Group of key stakeholders It is imperative to establish a shared understanding for the aims of the decision making parts of both the MCA and RAMP processes as soon as possible in the project life cycle. There are various groups of key stakeholders and each will have their own agenda and objectives. Typical stakeholders might include:

- Project Promoter (e.g. property developer),
- Project Client (e.g. central government),
- Project Financier (e.g. mix of central government and private banks), and
- Local Stakeholders (e.g. residents and local businesses).

It is essential to choose a balanced group of stakeholders to participate in the project appraisal process, to avoid bias during the development of project objectives and to ensure effective identification of project risks and opportunities; especially during the selection and weighting of the project appraisal criteria.

Sub-step 1.2: The design of the social technical system

The Steering Group will agree the programme and its application against wider policy and political concerns. It need to make appraisal decisions against a commonly acknowledged set of policy led directives and informed priorities; policy here can be international, national, or institution-specific; or a defined combination. The Steering Group will meet at key stages in the project life cycle as indicated in the RAMP handbook to address these.

Sub-step 1.3: Consideration of the context of the appraisal

Once the decision context has been fully described and appraised, and the risks and opportunities they pose are highlighted, this information can be passed on to RAMP Activity A.

Step 2: Identify options to be appraised (and preliminary project appraisal if required)

The next step of the MCA process is to establish the set of options or scenarios to be appraised. If there are many options, the MCA process serves to perform a structured sifting of these options to identify a short list, using simple data and quick procedures. If none of the options are acceptable, the Steering Group may identify the strongest points from each option to create a new set of hybrid options, or completely new options may be sought.

Step 3: Identify visions, objectives and criteria of project

The project objectives spawn the appraisal criteria (measures of performance) by which the project options are assessed during appraisal. The Steering Group should agree a series of criteria for each decision objective or sub-objective. These should be usable throughout the project appraisal, monitoring and (post-project completion) evaluation stages. Criteria for financial appraisal are far more developed than the social, environmental and institutional factors required for a holistic sustainable development appraisal, and thus special attention may need to be focused on the latter to compensate for this.

A policy framework appropriate to the context should be chosen. The choice of policy guidelines to use may be affected by the extent to which relevant ones actually exist. Where formal policy guidelines are lacking, the MCA framework can be used to focus policy development by the project Steering Group.

Once project appraisal criteria have been derived, they should be grouped into sets related to distinguishable components of the overall project objectives. This helps to check the relevance of the criteria, allow easy calculation of criteria weights and enable consideration of key issues and possible trade-offs. Once a set of project criteria has been developed, it can be passed onto the RAMP process to form the RAMP project baseline. A series of identical performance matrices are then created and applied to each option, including both quantitative and qualitative data.

Step 4: Scoring - describe the expected performance of each option against the project criteria and then score accordingly

Scores must now be developed to describe the consequence of the project options against each criterion. Both qualitative and quantitative impacts can be recorded under the relevant headings for each of the criteria or sub criteria. Project risk information should be dealt with explicitly in a separate column of the performance matrix, including both quantifiable and non-quantifiable risks. The matrix thus acts as a RAMP Risk Register, allowing all risks to be made transparent to the decision makers for each objective over each stage of the project life cycle. (These risks could subsequently require varying mitigation strategies over the period.)

The amount of detail in the impacts columns is related to the resources available to collect the information. The effort expended to gather data should be roughly proportional to the weights given to individual criteria in Step 5. As the project proceeds through the lifecycle certain project criteria may be identified as particularity important and further data can be gathered if deemed necessary.

Once impacts and related risks have been registered, the second stage of this step is to score the performance of an option against each of the criteria, taking account of risks. As the performance matrix will often contain a variety of performance indicators for different criteria - including both quantifiable and non-quantifiable - these different units cannot be combined to provide an overall assessment. To address this, the assessments should use some form of scaling against each criterion related to each objective; for example a five point scale expressed as follows: Positive, Slightly Positive, Neutral, Slightly Negative, Negative. Stakeholders could also score risks on a simple scale of acceptability.

The MCA framework enables the exposure of risks early in the project life cycle for early judgement by decision-makers. This allows the project to be shaped by an understanding of these potential risks (and opportunities). This is also the stage at which risk mitigation measures may be developed. These can be passed to the RAMP process for inclusion in the RAMP financial model.

Step 5: Weighting

The preference scales (scores) for each criterion derived by Step 4 cannot be combined at this stage because their units of measurement differ. To enable comparison, a numeric weighting system is required to clarify decision making. This could be through a hierarchical scoring system, using from 1 to 100 to indicate the relative importance of each criteria.

All weighting systems are vulnerable to stakeholder bias and political pressure, which can take much of the effort expended to arrive at equitable criteria, especially for social and environmental aspects of sustainability. Setting weights can also prove an area of contention. So weights for individual project appraisal criteria are informed by policy wherever possible. However, policies can sometimes prove vague over priorities or contradictory, and thus in such circumstances stakeholder discussion might be used to derive them. The decision making process which resulted in the choice of weights should, however, for transparency purposes be recorded in full.

Step 6: Examine the ranked results as a basis for decision maker

The outputs from application of the MCA framework and the analytical process it employs during project appraisal may offer a clear decision for a preferable project option, which would then trigger Activity C of the RAMP process. It may alternatively suggest a need for more information to inform the performance matrix (and RAMP Activity B), or even the necessity to go back to the beginning of the process and consider new options (RAMP Activity A).

Risk management during the project life cycle

Properly carrying out the early steps of project development within the MCA approach, through defining project boundaries, aims and context, forms a cost-effective way of reducing risk. Beyond the project appraisal stage, the MCA framework also provides a basis for the monitoring of risks post-construction and for identifying the potential impacts of significant changes in risk on the key project objectives. There are key RAMP process stages following project completion when Risk Review and Risk Management should be undertaken, through updating project performance against criteria and risks, monitoring progress and deciding on further mitigation as necessary. These stages include Investment Planning, Asset Creation and Operation. For the Closedown phase, the MCA framework can provide the basis for post project evaluation.

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