

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

**EXECUTIVE SUMMARY**

**Omega centre**  
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)

## EXECUTIVE SUMMARY

### STUDY CONTEXT AND WORK PROGRAMME

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. In view of this the Institution of Civil Engineers (ICE) and the Actuarial Profession (AP) decided in 2008 to revise their handbook on Risk Analysis and Management for Projects (RAMP), in order to address the appraisal and management of environmental and social risks. They commissioned the OMEGA Centre<sup>1</sup> at University College London to carry out a study and to provide recommendations on how better to incorporate environmental and social dimensions of sustainable development into the planning, appraisal and delivery of major infrastructure projects.

The work programme for the RAMP Study comprised five main stages:

- **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.
- **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).
- **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.
- **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.
- **A synthesis of the findings from these successive stages**, which provided the basis for the Study conclusions and recommendations. These were incorporated into the Study's Final Report and into a draft new chapter for the next edition of the RAMP Handbook.

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<sup>1</sup> The OMEGA Centre (see [www.omegacentre.bartlett.ucl.ac.uk](http://www.omegacentre.bartlett.ucl.ac.uk)) is a global centre of excellence funded by the Volvo Research and Education Foundations (VREF). It is based at the Bartlett School of Planning and has nine partner universities across the world. The Centre's research focuses on understanding better key decision making in the planning, appraisal and delivery of Mega Urban Transport projects (MUTPs), based on in-depth studies of thirty case studies. The Centre has as its overall mission the task of establishing what constitutes a 'successful' MUTP for the 21<sup>st</sup> Century in light of the growing risks and uncertainties of the future and the challenges of sustainable development

## STUDY OUTPUTS

During the work programme a series of intermediate reports and Working Papers was prepared. From these the Study Team produced two main outputs whose contents are briefly outlined in this Executive Summary:

- **A Final Report**, setting out and reviewing the wide range of findings derived from the research work undertaken.
- **A draft new chapter for the next edition of the RAMP Handbook**, drawing from the findings of the Final Report. This sets out a recommended multi-criteria framework and methodology, consistent with the RAMP Process, for identifying, appraising and managing environmental and social risks for major infrastructure projects.

## STUDY FINDINGS

The following paragraphs briefly outline the main Study findings, which are fully explored in the Final Report. They are covered under two main themes, with some key statistics from the questionnaire surveys quoted.

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

**Economic growth:** 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. Today this premise is challenged by a broader agenda of multiple development aims as reflected in the concept of sustainable development<sup>2</sup>. 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.

**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*, the *UN Millennium Development Goals* and the *EU Strategy for Sustainable Development*.

**Environmental factors:** These are primarily physical in nature but are closely bound up with the quality of life in terms of their social and economic impacts. Environmental and social factors of sustainable development are not externalities to development. Instead, they comprise its fundamental components, on an integrated basis with economic factors and aspects of institutional development and governance. In consequence, there is growing interest in establishing new planning, appraisal and delivery methodologies for infrastructure project development that can

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<sup>2</sup> Defined by the Brundtland Report in 1987 as "meeting the needs of the present generation without compromising the ability of future generations to meet their needs."

more appropriately address the widening range of environmental and social concerns of the 21<sup>st</sup> century.

**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 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. 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:** Few practitioners now publicly share the former conventional view that economic growth should be the sole, even dominant, concern of project appraisal<sup>3</sup>. But there remain differing views on what sustainability actually involves, and how 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.

### **The case for broader appraisal frameworks**

**Economic Growth:** While infrastructure project appraisal methodologies continue to evolve, most are still appraised against traditional targets of economic growth; even though support for this principle now appears to have significantly reduced. The quest for broader project appraisal frameworks, through enhancement of Social Cost Benefit Analysis or the use of Multi-Criteria Analysis, reflects increasing concern over the sustainability of current development patterns. This has led to formal requirements, set out in many governments’ policy documents, to incorporate environmental impact studies into infrastructure plans and projects.

**Project Investment Appraisal:** Where private sector funds are invested in project developments, investors clearly need to generate a commercial return, and subsequently are obliged to employ a financial appraisal of the forecast cash flows (usually through Financial Cost Benefit Appraisal). But most investment in major infrastructure development continues to be based on traditional forms of Social Cost Benefit Analysis (CBA). Appraisals of this kind provide an interpretation of the main factors in monetary terms, summarised in a single rate of return figure that is important especially for public sector bodies, which are usually the project sponsors

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<sup>3</sup> 81% of survey respondents acknowledged that economic growth should not be ‘king’ of all appraisal criteria.

and may be major investors. CBA combines cash flows with monetized values for factors such as time, accidents, and air quality.

**Monetisation:** While substantial research continues on establishing sound monetary values for some environmental and social factors, practical difficulties remain. For social factors, even where monetary values can be attributed, there remain critical questions over distributional effects; i.e. the varying impacts on different communities and on different societal groups. Furthermore, 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<sup>4</sup>.

**Environmental and social factors:** 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<sup>5</sup>. 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 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

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<sup>6</sup>.

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. The MCA

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<sup>4</sup> 91% of survey respondents disagreed with the premise that monetization is essential to sound project appraisal.

<sup>5</sup> 63% of survey respondents agreed fully or conditionally with the premise that firm objectives and visions for projects are seen as important.

<sup>6</sup> 76% of survey respondents confirmed that project appraisal could more effectively employ MCA rather than CBA alone.

framework recommended by the Study involves a six stage process. Figure 1 (appended) shows how the structure relates to the project life cycle<sup>7</sup>.

Most importantly, the framework can be successfully integrated with the four activities of the RAMP process, as shown in Figure 1. This process<sup>8</sup> 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.

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.

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. This is reinforced by the RAMP set of procedures. Together these offer a powerful approach for project appraisal that clarifies which project criteria should have priority, under which set of circumstances, for which stakeholder.
- **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 or the RAMP process simply because quantification is not practical.
- **A framework for making structured trade-offs:** With the assistance of the RAMP Process, 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 and at the different stages of the RAMP Process.
- **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.

<sup>7</sup> See *RAMP Study Final Report* for the full structure of the recommended approach.

<sup>8</sup> See *RAMP Handbook* for details of the RAMP process.

- **The promotion of stakeholder participation:** The framework supports sound project development and design principles in accordance with the RAMP procedures because it is grounded on the effective involvement of all project stakeholders, not only its sponsors and supporters<sup>9</sup>.
- **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 to be fed into the RAMP process.
- **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, supported by the RAMP Process, 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.

## REFERENCES

- Institution of Civil Engineers & The Actuarial Profession, (2005), *RAMP – Risk Analysis and Management for Projects*, Thomas Telford, London
- OMEGA Centre, (2010), *RAMP Study – Final Report*, OMEGA Centre, Bartlett School of Planning, University College London, London

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<sup>9</sup> 92% of survey respondents supported the premise that the engagement of all stakeholders in the project appraisal process is essential, two thirds unconditionally.

**Figure 1: Use of the MCA framework in project development and the RAMP process**

