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INTRODUCTION TO ENVIRONMENTAL IMPACT ASSESSMENT

FOURTH EDITION

THE NATURAL AND BUILT ENVIRONMENT SERIES

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ROUTLEDGE

Introduction to Environmental Impact Assessment

4th edition

Introduction to Environmental Impact Assessment provides students and practitioners with a clearly structured overview of the subject, as well as critical analysis and support for further studies. Written by three authors with extensive research, training and practical experience in EIA, the book covers the latest EIA legislation, guidance and good practice.

Featuring an extended case studies section that explores more key issues than in previous editions, this 4th edition also updates essential information on:

- the evolving nature of EIA;
- experience of the implementation of the changing EU and UK EIA procedures;
- best practice in the EIA process;
- comparative EIA systems worldwide;
- development of SEA/SA legislation and practice; and
- prospects for the future of EIA.

Although the book's focus is on the UK and the EU, the principles and techniques it describes are applicable internationally. With colour images and a new modern design, the book provides an essential introduction to EIA for undergraduate and postgraduate students on planning courses, as well as those studying environmental management and policy, environmental sciences, geography and the built environment. Planners, developers, community groups and decision-makers in government and business will also welcome the book as an effective way to get to grips with this important and evolving subject that affects a wide range of development projects.

John Glasson is Emeritus Professor of Environmental Planning, Founding Director of the Impacts Assessment Unit (IAU) and of the Oxford Institute for Sustainable Development (OISD), at Oxford Brookes University. He is also Visiting Professor at Curtin University in Western Australia.

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and Andrew Chadwick

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First edition published 1994
by UCL Press

Second edition published 1999
by UCL Press

Third edition published 2005
by Routledge

This edition first published 2012
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

Simultaneously published in the USA and Canada
by Routledge
711 Third Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data
Glasson, John
Introduction to environmental impact assessment / John Glasson, Riki Therivel and Andrew Chadwick. — 4th ed.
p. cm. — (The natural and built environment series)
Includes bibliographical references and index.
1. Environmental impact assessment—Great Britain. 2. Environmental impact assessment. I. Therivel, Riki II. Chadwick, Andrew III. Title.
TD194.68.G7G58 2012
333.71′4—dc23 2011026482

ISBN: 978–0–415–66468–4 (hbk)
ISBN: 978–0–415–66470–7 (pbk)

Typeset in Stone Serif and Akzidenz Grotesk
by Florence Production Ltd, Stoodleigh, Devon

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Preface to the first edition

There has been a remarkable and refreshing interest in environmental issues over the past few years. A major impetus was provided by the 1987 Report of the World Commission on the Environment and Development (the Brundtland Report); the Rio Summit in 1992 sought to accelerate the impetus. Much of the discussion on environmental issues and on sustainable development is about the better management of current activity in harmony with the environment. However, there will always be pressure for new development. How much better it would be to avoid or mitigate the potential harmful effects of future development on the environment at the planning stage. Environmental impact assessment (EIA) assesses the impacts of planned activity on the environment in advance, thereby allowing avoidance measures to be taken: prevention is better than cure.

Environmental impact assessment was first formally established in the USA in 1969. It has spread worldwide and received a significant boost in Europe with the introduction of an EC Directive on EIA in 1985. This was implemented in the UK in 1988. Subsequently there has been a rapid growth in EIA activity, and over 300 environmental impact statements (EISs) are now produced in the UK each year. EIA is an approach in good currency. It is also an area where many of the practitioners have limited experience. This text provides a comprehensive introduction to the various dimensions of EIA. It has been written with the requirements of both undergraduate and postgraduate students in mind. It should also be of considerable value to those in practice – planners, developers and various interest groups. EIA is on a rapid 'learning curve'; this text is offered as a point on the curve.

The book is structured into four parts. The first provides an introduction to the principles of EIA and an overview of its development and agency and legislative context. Part 2 provides a step-by-step discussion and critique of the EIA process. Part 3 examines current practice, broadly in the UK and in several other countries, and in more detail through selected UK case studies. Part 4 considers possible future developments. It is likely that much more of the EIA iceberg will become visible in the 1990s and beyond. An outline of important and associated developments in environmental auditing and in strategic environmental assessment concludes the text.

Although the book has a clear UK orientation, it does draw extensively on EIA experience worldwide, and it should be of interest to readers from many countries. The book seeks to highlight best practice and to offer enough insight to methods, and to supporting references, to provide valuable guidance to the practitioner. For information on detailed methods for assessment of impacts in particular topic areas (e.g. landscape, air quality, traffic impacts), the reader is referred to the complementary volume, *Methods of environmental impact assessment* (Morris and Therivel, 1995, London, UCL Press).

John Glasson
Riki Therivel
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Preface to the fourth edition

The aims and scope of this fourth edition are unchanged from those of the first edition. However, as noted in the preface to the first edition, EIA continues to evolve and adapt, and any commentary on the subject must be seen as part of a continuing discussion. The worldwide spread of EIA is becoming even more comprehensive. In the European Union there is now over 25 years' experience of the implementation of the pioneering EIA Directive, including 10 years' experience of the important 1999 amendments. There has been considerable interest in the development of the EIA process, in strengthening perceived areas of weakness, in extending the scope of activity and also in assessing effectiveness. Reflecting such changes, this fully revised edition updates the commentary by introducing and developing a number of issues that are seen as of growing importance to both the student and the practitioner of EIA.

The structure of the first edition has been retained, plus much of the material from the third edition, but considerable variations and additions have been made to specific sections. In Part 1 (on principles and procedures), the importance of an adaptive EIA, plus the burgeoning range of EA activity, are addressed further. In the EU context, the implementation of the amended EIA Directive is discussed more fully, including the divergent practice across the widening range of Member States. The specific new 2011 regulations and procedures operational in the UK are set out in Chapter 3. In Part 2 (discussion of the EIA process), most elements have been updated, including screening and scoping, alternatives, impact identification, prediction, participation and presentation, mitigation and enhancement, and monitoring and auditing.

We have made major changes to Part 3 (overview of practice), drawing on the findings of important reviews of EIA effectiveness and operation in practice. For example, Chapter 8 includes much new material on the implication of legal challenges in EIA. Chapter 9 includes some new practice case studies. Most of the case studies are UK-based and involve EIA at the individual project level, although two examples of SEA are also discussed, plus new topics such as health impact assessment. While it is not claimed that the selected case studies all represent best examples of EIA practice, they do include some novel and innovative approaches towards particular issues in EIA, such as new methods of public participation and the treatment of cumulative effects. They also draw attention to some of the limitations of the process in practice. Chapter 10 (Comparative practice) has also had a major revision, reflecting, for example, growing experience in African countries, China and countries in transition, and major reviews for some well-established EIA systems in, for example, Canada and Australia.

Part 4 of the book (Prospects) has also been substantially revised to reflect some of the changing prospects for EIA. Chapter 11 discusses the need for strategic environmental assessment (SEA) and some of its limitations. It reviews the status of SEA in the USA, European Union and UNECE, and China. It then discusses in more detail how the European SEA Directive is being implemented in the UK. It concludes with the results of recent research into the effectiveness of the SEA Directive. Chapter 12 has been extensively revised and extended. It includes, for example, more consideration of cumulative impacts, socio-economic impacts, health impact assessment, equalities impact assessment, appropriate assessment, the new area of resilience thinking, and the vitally important topic of planning for climate change in EIA, plus possible shifts towards more integrated assessment. The chapter concludes with a discussion of the parallel and complemen-

tary development of environmental management systems and audits. Together, these topics act as a kind of action list for future improvements to EIA. This chapter in particular, but also much else in the book, draws on some of the findings of recent reviews of EIA practice undertaken by, among others, the EC, the IAIA (International Association for Impact Assessment) and the IEMA (the Institute of Environmental Management and Assessment).

The Appendices include the full versions of the amended EIA Directive and the SEA Directive, a revised IAU EIS review package, and a guide to key EIA journals and websites worldwide.

John Glasson
Riki Therivel
Andrew Chadwick
Oxford 2011

Acknowledgements

Our grateful thanks are due to many people without whose help this book would not have been produced. We are particularly grateful for the tolerance and moral support of our families. Our thanks also go to Rob Woodward for his production of many of the illustrations. In addition, Louise Fox of Taylor and Francis, and copy-editor Rosalind Davies, and editorial assistant Aimee Miles have provided vital contributions in turning the manuscript into the innovative published document. We are very grateful to our consultancy clients and research sponsors, who have underpinned the work of the Impacts Assessment Unit in the School of Planning at Oxford Brookes University (formerly Oxford Polytechnic). In particular we wish to record the support of UK government departments (variously DoE, DETR, ODPM and DCLG), the EC Environment Directorate, the Economic and Social Research Council (ESRC), the Royal Society for the Protection of Birds (RSPB), many local and regional authorities, and especially the various branches of the UK energy industry that provided the original impetus to and continuing positive support for much of our EIA research and consultancy.

Our students at Oxford Brookes University on both undergraduate and postgraduate programmes have critically tested many of our ideas. In this respect we would like to acknowledge, in particular, the students on the MSc course in Environmental Assessment and Management. The editorial and presentation support for the fourth edition by the staff at Taylor and Francis is very gratefully acknowledged. We have benefited from the support of colleagues in the Schools of Planning and Biological and Molecular Sciences, and from the wider community of EIA academics, researchers and consultants, who have helped to keep us on our toes. We are grateful to Angus Morrison-Saunders for some very useful pointers in his most constructive review of our third edition, and to Shanshan Yang for advice on the evolving approach to EIA in China. We owe particular thanks in this edition for the willingness of Josh Fothergill at IEMA, and Kim Chowns at DCLG, to provide advance copies of the IEMA 2011 Report on UK EIA practice, and the new 2011 DCLG EIA Regulations and Guidance. We are also grateful for permission to use material from the following sources:

British Association of Nature Conservationists (cartoons: Parts 2 and 3)
RPS, Symonds/EDAW and Magnox Electric (Plate 1.1)
EIA Review (Figure 1.9)
ENDS (Tables 3.1 and 3.2)
Scottish government (Figures 4.1 and 4.2)
Pattersons Quarries (Figure 4.3)
South Yorkshire Integrated Transport Authority (Figure 4.6)
Scottish Power Systems (Figure 4.8)
IEMA (Figure 5.1 and 12.6, Tables 8.5, 12.4, 12.6 and 12.7)
EDF Energy, Southampton Daily Echo, Guardian Newspaper (Figure 6.1)
Metropolitan Council (Minneapolis/St Paul), AREVA Resources Canada , Griff Wigley, Evelop (Figure 6.2)
University of Manchester, EIA Centre (Appendix 4)
Olympic Delivery Authority (Figure 7.7)
Highlands and Islands Enterprise (Figure 9.3)
John Wiley & Sons (Table 6.2)
Baseline Environmental Consulting, West Berkeley, California (Figure 7.2)
UK Department of Environment (Table 6.3)
UK Department of Communities and Local Government (Tables 3.5, 3.6 and 3.7; Appendix 2)

Planning newspaper (cartoon: Part 4)
Beech Tree Publishing (Figure 7.8)
European Commission (Table 4.3, Box 11.1, Table 12.5)
West Australian Environmental Protection Agency (Table 10.2, Figure 10.5)
West Australian Department of Health (Figure 12.2)
Scott Wilson (Table 12.3)
Dover District Council (Figure 11.3)
Office of the Deputy Prime Minister (Box 11.2)

Abbreviations and acronyms

AA	Appropriate assessment
ABI	UK Annual Business Inquiry
ADB	African Development Bank
ADB	Asian Development Bank
AEE	Assessment of environmental effects
AEP	Association of Environmental Professionals
ANZECC	Australia and New Zealand Environment and Conservation Council
AONB	Area of Outstanding Natural Beauty
APC	Air pollution control
API	Assessment on Proponent Information (WA)
AQMA	Air quality management area
BAA	BAA Airports Limited (previously British Airports Authority)
BANANA	Build absolutely nothing anywhere near anything
BG	Bulgaria
BIO	Bio Intelligence Service S.A.S.
BME	Black and minority ethnic
BP	BP (previously British Petroleum)
BPEO	Best practicable environmental option
BS	British Standard
BWEA	British Wind Energy Association
CAREC	Regional Environmental Centre for Central Asia
CBA	Cost–benefit analysis
CC	County Council
CCGT	Combined-cycle gas turbine
CCHP	Combined cooling heat and power
CCS	Carbon capture and storage
CCW	Countryside Council for Wales
CE	Categorical exclusion
CEA	Cumulative effects assessment
CEAA	Canadian Environmental Assessment Agency
CEAM	Cumulative effects assessment and management
CEARC	Canadian Environmental Assessment Research Council
CEC	Commission of the European Communities
CEGB	Central Electricity Generating Board
CEMP	Construction environmental management plan
CEPA	Commonwealth Environmental Protection Agency (Australia)
CEQ	US Council on Environmental Quality
CEQA	California Environmental Quality Act
CHP	Combined heat and power
CIA	Cultural impact assessment
CIE	Community impact evaluation
CISDL	Centre for International Sustainable Development Law
CITES	Convention on Trade in Endangered Species
CO_2	Carbon dioxide
COWI	COWI A/S
CPO	Compulsory purchase order
CPRE	Campaign to Protect Rural England
CRM	Contingent ranking method
CRS	US Congressional Research Service
CRTN	Calculation of road traffic noise
CSR	Corporate social responsibility
CVM	Contingent valuation method
CY	Cyprus
CZ	Czech Republic
dB	Decibels
dBA	A-weighted decibels

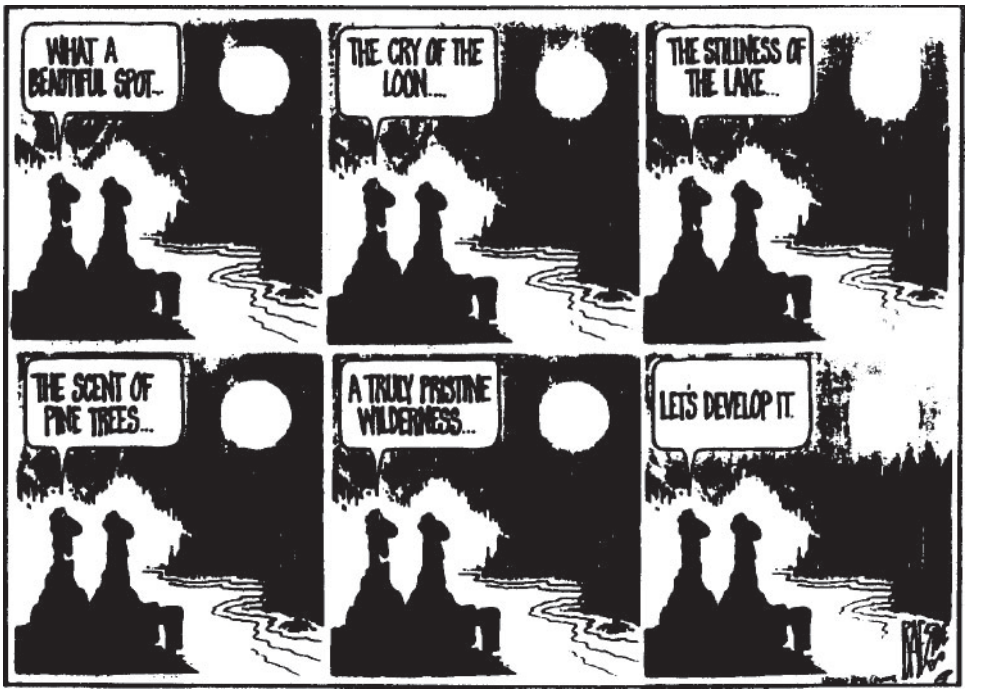
DA	Devolved administration (in the UK)
DBIS	UK Department for Business, Innovation and Skills
DC	District Council
DCLG	UK Department for Communities and Local Government
DECC	UK Department of Energy and Climate Change
DEFRA	UK Department for Environment, Food and Rural Affairs
DETR	UK Department of Environment, Transport and the Regions
DFID	UK Department for International Development
DfT	UK Department for Transport
DG	Directorate General (CEC)
DMRB	Design manual for roads and bridges
DoE	UK Department of the Environment
DOEn	UK Department of Energy
DoT	UK Department of Transport
DTI	UK Department for Trade and Industry
EA	Environmental assessment
EA	UK Environment Agency
EAGGF	European Agricultural Guidance and Guarantee Fund
EAP	Environmental action plan
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EcIA	Ecological impact assessment
ECJ	European Court of Justice
EDF	Électricité de France
EE	Estonia
EEA	European Environment Agency
EIA	Environmental impact assessment
EIB	European Investment Bank
EID	Environmental impact design
EIR	Environmental impact report
EIR	Environmental impact review
EIS	Environmental impact statement
EM&A	Environmental monitoring and audit
EMAS	Eco-Management and Audit Scheme
EMP	Environmental management plan
EMS	Environmental management system
EN	English Nature
ENDS	Environmental Data Services
EPA	UK Environmental Protection Act
EPA	US Environmental Protection Act
EPA	US Environmental Protection Agency
EPA	West Australian Environmental Protection Authority
EPB	Environmental Protection Bureau (China)
EPBCA	Environmental Protection and Biodiversity Conservation Act (Australia)
EPD	Hong Kong Environmental Protection Department
EqIA	Equality impact assessment
ERM	Environmental Resources Management Limited
ES	Environmental statement
ESRC	Economic and Social Research Council
ETSU	Energy Technology Support Unit
EU	European Union
FEARO	Federal Environmental Assessment Review Office
FEIS	Final environmental impact statement
FHWA	US Federal Highway Administration
FoE	Friends of the Earth
FONSI	Finding of no significant impact
G1; G2	Generation 1; Generation 2
GAM	Goals achievement matrix
GHG	Greenhouse gases
GHK	GHK Consulting Limited
GIS	Geographical information systems
GNP	Gross national product
GP	General practitioner
GPDO	General Permitted Development Order
GW	Gigawatt
ha	Hectare
HEP	Hydro-electric power
HGV	Heavy goods vehicle
HIA	Health impact assessment
HMG	Her Majesty's Government
HMIP	Her Majesty's Inspectorate of Pollution
HMSO	Her Majesty's Stationery Office
HPF	Household production function
HPM	Hedonic price methods
HRA	Habitats regulation assessment
HSE	Health and Safety Executive
HU	Hungary
HWS	Hampshire Waste Services
IA	Impact assessment
IAIA	International Association for Impact Assessment
IAU	Impacts Assessment Unit (Oxford Brookes)
IEA	Institute of Environmental Assessment

IEMA	Institute of Environmental Management and Assessment
IFI	International Funding Institution
IIA	Integrated impact assessment
IMD	Index of Multiple Deprivation
INEM	International Network for Environmental Management
IOCGP	Inter-organizational Committee on Guidelines and Principles for Social Impact Assessment
IPC	Infrastructure Planning Commission
IPC	Integrated pollution control
IPCC	Intergovernmental Panel on Climate Change
IPHI	Institute of Public Health in Ireland
ISO	International Organization for Standardization
IWM	Institute of Waste Management
JEAPM	Journal of Environmental Assessment Policy and Management
JNCC	Joint Nature Conservancy Council
KSEIA	Korean Society of Environmental Impact Assessment
kV	Kilovolt
L_{10}	Noise level exceeded for no more than 10 per cent of a monitoring period
LB	London Borough
LCA	Life cycle assessment
LNG	Liquified natural gas
LPA	Local planning authority
LT	Lithuania
LTP	Local transport plan
LTP3	Third local transport plan
LULU	Locally unacceptable land uses
LV	Latvia
MAFF	UK Ministry of Agriculture, Forestry and Fisheries
MAUT	Multi-attribute utility theory
MBC	Metropolitan Borough Council
MCA	Multi-criteria assessment
MCDA	Multi-criteria decision analysis
MEA	Manual of Environmental Appraisal
MMO	Marine Management Organization (UK)
MoD	UK Ministry of Defence
MOEP	Ministry of Environmental Protection (China)
MT	Malta
MW	Megawatt
NE	Natural England
NEPA	US National Environmental Policy Act
NGC	National Grid Company
NGO	Non-governmental organization
NHS	National Health Service
NIMBY	Not in my back yard
NO_x	Nitrogen oxide
NPDV	Net present day value
NPS	National Policy Statement
NSIP	Nationally significant infrastructure project
NTS	Non-technical summary
ODA	Olympic Delivery Authority
ODPM	UK Office of the Deputy Prime Minister
OECD	Organisation for Economic Co-operation and Development
OISD	Oxford Institute for Sustainable Development
OJ	Official Journal of the European Communities
OTP	Operational Transport Programme
PADC	Project Appraisal for Development Control
PAS	Planning Advisory Service
PBS	Planning balance sheet
PEIR	Programme environmental impact report
PEIS	Programmatic environmental impact statement
PER	Public Environmental Review (WA)
PIC	Partnerships in Care
PL	Poland
PM_{10}	Particulate matter of less than 10 microns in diameter
PPG	Planning Policy Guidance
PPPs	Policies, plans and programmes
PPPP	Policy, plan, programme or project
PPS	Planning policy statement
PWR	Pressurized water reactor
QBL	Quadruple bottom line
QOLA	Quality of life assessment
RA	Resilience Alliance
RA	Risk assessment
RMA	Resource Management Act (NZ)
RO	Romania
ROD	Record of decision
RSPB	Royal Society for the Protection of Birds
RTPI	Royal Town Planning Institute
S106	Section 106

SA	Sustainability appraisal
SAC	Special Area of Conservation
SAIEA	Southern African Institute for Environmental Assessment
SAVE	SAVE Britain's Heritage
SD	Sustainable development
SDD	Scottish Development Department
SEA	Strategic environmental assessment
SEERA	South East England Regional Assembly
S&EIA	Socio-economic and environmental impact assessment
SEPA	Scottish Environment Protection Agency
SI	Slovenia
SIA	Social impact assessment
SK	Slovakia
SNH	Scottish Natural Heritage
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SO_2	Sulphur dioxide
SOER	State of the Environment Report
SoS	Secretary of State
SPA	Special Protection Area
SSE	Stop Stansted Expansion
SSSI	Site of Special Scientific Interest
TBL	Triple bottom line
T&CP	Town and country planning
TIA	Transport impact assessment
TRL	Transport Research Laboratory
UKNEA	UK National Ecosystem Assessment
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
US	United States
USAID	United States Agency for International Development
VEC	Valued ecosystem component
VMP	Visitor management plan
VROM	Netherlands Ministry of Housing, Spatial Planning and the Environment
WA	Western Australia
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organization
WID	USAID Women in Development
WTA	Willingness to accept
WTP	Willingness to pay

Part 1

Principles and procedures



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1 Introduction and principles

1.1 Introduction

Over the last four decades there has been a remarkable growth of interest in environmental issues – in sustainability and the better management of development in harmony with the environment. Associated with this growth of interest has been the introduction of new legislation, emanating from national and international sources such as the European Commission, that seeks to influence the relationship between development and the environment. Environmental impact assessment (EIA) is an important example. EIA legislation was introduced in the USA over 40 years ago. A European Community (EC) directive in 1985 accelerated its application in EU Member States and it has spread worldwide. Since its introduction in the UK in 1988, it has been a major growth area for planning practice; the originally anticipated 20 environmental impact statements (EIS) per year in the UK has escalated to several hundreds, and this is only the tip of the iceberg. The scope of EIA continues to widen and grow.

It is therefore perhaps surprising that the introduction of EIA met with strong resistance from many quarters, particularly in the UK. Planners argued, with partial justification, that they were already making such assessments. Many developers saw it as yet another costly and time-consuming constraint on development, and central government was also unenthusiastic. Interestingly, initial UK legislation referred to environmental assessment (EA), leaving out the apparently politically sensitive, negative-sounding reference to impacts. The scope of the subject continues to evolve. This chapter therefore introduces EIA as a process, the purposes of this process, types of development, environment and impacts, and current issues in EIA.

1.2 The nature of EIA

1.2.1 Definitions

Definitions of EIA abound. They range from the oft-quoted and broad definition of Munn (1979), which refers to the need 'to identify and predict the impact on the environment and on man's health and well-being of legislative proposals, policies, programmes, projects and operational procedures, and to interpret and communicate information about the impacts', to the narrow and early UK DoE (1989) operational definition:

> The term 'environmental assessment' describes a technique and a process by which information about the environmental effects of a project is collected, both by the

developer and from other sources, and taken into account by the planning authority in forming their judgements on whether the development should go ahead.

UNECE (1991) had an altogether more succinct and pithy definition: 'an assessment of the impact of a planned activity on the environment'. The EU EIA Directive requires an assessment of the effects of certain public and private projects, which are likely to have significant effects on the environment, before development consent is granted; it is procedurally based (see Appendix 1). The EIA definition adopted by the International Association for Impact Assessment (IAIA 2009) is 'the process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of proposed development proposals prior to major decisions being taken and commitments made'. This process emphasis is now explored further.

1.2.2 EIA: a process

In essence, EIA is *a process*, a systematic process that examines the environmental consequences of

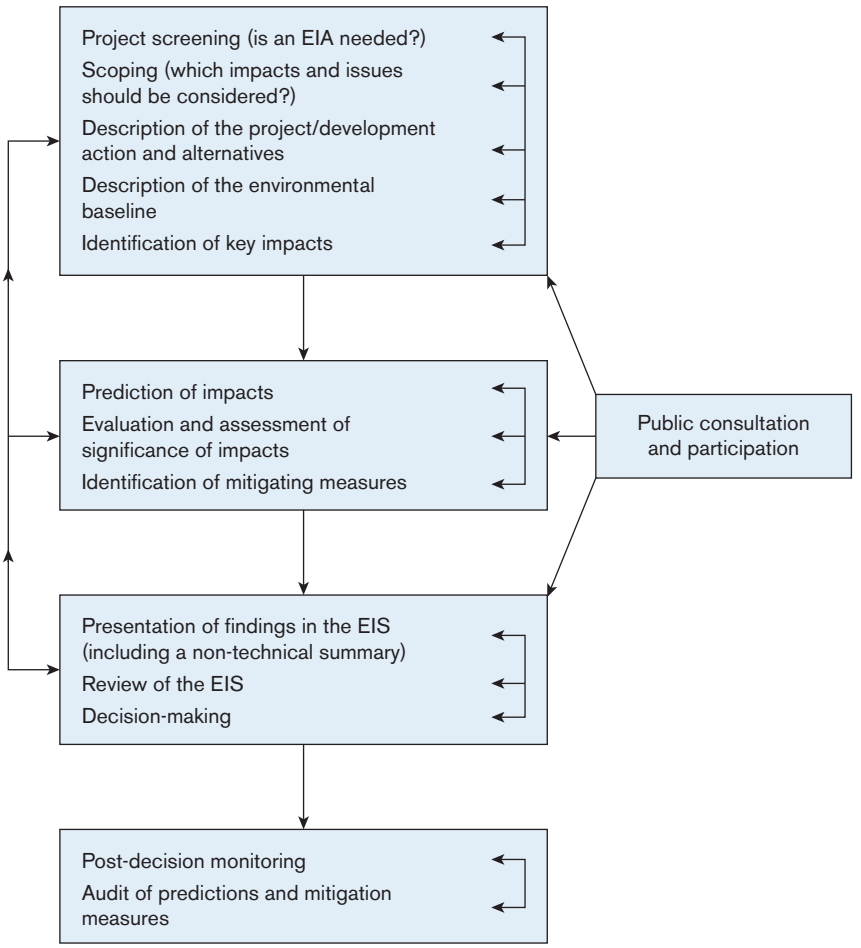


Figure 1.1

Important steps in the EIA process

Note that EIA should be a cyclical process, with considerable interaction between the various steps. For example, public participation can be useful at most stages of the process; monitoring systems should relate to parameters established in the initial project and baseline descriptions.

development actions, in advance. The emphasis, compared with many other mechanisms for environmental protection, is on prevention. Of course, planners have traditionally assessed the impacts of developments on the environment, but invariably not in the systematic, holistic and multidisciplinary way required by EIA. The process involves a number of steps, as outlined in Figure l.l.

The steps are briefly described below, pending a much fuller discussion in Chapters 4–7. It should be noted at this stage that, although the steps are outlined in a linear fashion, EIA should be a cyclical activity, with feedback and interaction between the various steps. It should also be noted that practice can and does vary considerably from the process illustrated in Figure 1.1. For example, UK EIA legislation still does not require post-decision monitoring. The order of the steps in the process may also vary.

- *Project screening* narrows the application of EIA to those projects that may have significant environmental impacts. Screening may be partly determined by the EIA regulations operating in a country at the time of assessment.
- *Scoping* seeks to identify at an early stage, from all of a project's possible impacts and from all the alternatives that could be addressed, those that are the crucial, significant issues.
- *The consideration of alternatives* seeks to ensure that the proponent has considered other feasible approaches, including alternative project locations, scales, processes, layouts, operating conditions and the 'no action' option.
- *The description of the project/development action* includes a clarification of the purpose and rationale of the project, and an understanding of its various characteristics – including stages of development, location and processes.
- *The description of the environmental baseline* includes the establishment of both the present and future state of the environment, in the absence of the project, taking into account changes resulting from natural events and from other human activities.
- *The identification of the main impacts* brings together the previous steps with the aim of ensuring that all potentially significant environmental impacts (adverse and beneficial) are identified and taken into account in the process.
- *The prediction of impacts* aims to identify the magnitude and other dimensions of identified change in the environment with a project/action, by comparison with the situation without that project/action.
- *The evaluation and assessment of significance* assesses the relative significance of the predicted impacts to allow a focus on the main adverse impacts.
- *Mitigation* involves the introduction of measures to avoid, reduce, remedy or compensate for any significant adverse impacts. In addition *enhancement* involves the development of beneficial impacts where possible.
- *Public consultation and participation* aim to ensure the quality, comprehensiveness and effectiveness of the EIA, and that the public's views are adequately taken into consideration in the decision-making process.
- *EIS presentation* is a vital step in the process. If done badly, much good work in the EIA may be negated.
- *Review* involves a systematic appraisal of the quality of the EIS, as a contribution to the decision-making process.
- *Decision-making* on the project involves a consideration by the relevant authority of the EIS (including consultation responses) together with other material considerations.
- *Post-decision monitoring* involves the recording of outcomes associated with development impacts, after a decision to proceed. It can contribute to effective project management.
- *Auditing* follows from monitoring. It can involve comparing actual outcomes with predicted outcomes, and can be used to assess the quality of predictions and the effectiveness of mitigation. It provides a vital step in the EIA learning process.

1.2.3 *Environmental impact statements: the documentation*

The EIS documents the information about and estimates of impacts derived from the various steps in the process.[1] Prevention is better than cure; an EIS revealing many significant unavoidable adverse impacts would provide valuable information that could contribute to the abandonment or substantial modification of a proposed development action. Where adverse impacts can be successfully reduced through mitigation measures, there may be a different decision. Table 1.1 provides an example of the content of an EIS for a project.

Table 1.1 An EIS for a project – example of contents

Non-technical summary

Part 1: Introduction, methods and key issues
- Introduction
- Methodology
- Summary of key issues

Part 2: Background to the proposed development
- Preliminary studies: need, planning, alternatives and site selection
- Site description, baseline conditions
- Description of proposed development
- Development programme, including site preparation, construction, operation, decommissioning and restoration (as appropriate)

Part 3: Environmental impact assessment – topic areas
- Land use
- Geology, topography and soils
- Hydrology and water quality
- Air quality
- Climate change
- Ecology: terrestrial and aquatic
- Noise and vibration
- Socio-economics
- Transport
- Landscape, visual quality
- Historic environment
- Recreation and amenity
- Interrelationships between effects
- Cumulative impacts
- Summary of residual impacts

Part 4: Follow-up and management
- Monitoring of impacts
- Management of impacts

The *non-technical summary* is an important element in the documentation; EIA can be complex, and the summary can help to improve communication with the various parties involved. Reflecting the potential complexity of the process, an *introduction* should clarify, for example, who the developer is, who has produced the EIS, and the relevant legal framework. Also at the beginning, a *methodology section*, provides an opportunity to clarify some basic information (e.g. what methods have been used, how the key issues were identified, who was consulted and how, what difficulties have been encountered, and what are the limitations of the EIA). The *background to the proposed development* covers the early steps in the EIA process, including clear descriptions of a project, and baseline conditions (including relevant planning policies and plans).

Within each of the *topic areas* of an EIS there would normally be a discussion of existing conditions, predicted impacts, scope for mitigation and enhancement, and residual impacts. The list here is generic, and there are some topics that are still poorly covered, for example climate change and cumulative impacts (as appropriate). A concluding section, although often omitted from EISs, should cover key *follow-up issues*, including monitoring and management.

Environmental impact assessment and EIS practices vary from study to study, from country to country, and best practice is constantly evolving. An early UN study of EIA practice in several countries advocated changes in the process and documentation (UNECE 1991). These included giving a greater emphasis to the socio-economic dimension, to public participation and to 'after the decision' activity, such as monitoring. More recent reviews of the operation of the amended EC Directive (CEC 2003a, 2009) raised similar issues, and other emerging issues, a decade later (see Chapter 2). Sadler (1996) provided a wider agenda for change based on a major international study of the effectiveness of EIA, being updated in 2010–11 (see Chapters 8 and 12).

1.3 The purposes of EIA

1.3.1 An aid to decision-making

EIA is an aid to decision-making. For the decision-maker, for example a local authority, it provides a systematic examination of the environmental implications of a proposed action, and sometimes alternatives, before a decision is taken. The EIS can be considered by the decision-maker along with other documentation related to the planned activity. EIA is normally wider in scope and less quantitative than other techniques, such as cost–benefit analysis (CBA). It is not a substitute for decision-making, but it does help to clarify some of the trade-offs associated with a proposed development action, which should lead to more informed and structured decision-making. The EIA process has the potential, not always taken up, to be a basis for negotiation between the developer, public interest groups and the planning regulator. This can lead to an outcome that balances well the interests of the development action and the environment.

1.3.2 An aid to the formulation of development actions

Developers may see the EIA process as another set of hurdles to jump before they can proceed with their various activities; the process can be seen as yet another costly and time-consuming activity in the development consent process. However, EIA can be of great benefit to them, since it can provide a framework for considering location and design issues and environmental issues in parallel. It can be an aid to the formulation of development actions, indicating areas where a project can be modified to minimize or eliminate altogether its adverse impacts on the environment. The consideration of environmental impacts early in the planning life of a development can lead to more environmentally sensitive development; to improved relations between the developer, the planning authority and the local communities; to a smoother development consent process; and sometimes to a worthwhile financial return on the extra expenditure incurred. O'Riordan (1990) links such concepts of negotiation and redesign to the important environmental themes of 'green consumerism' and 'green capitalism'. The growing demand by consumers for goods that do no environmental damage, plus a growing market for clean technologies, is generating a response from developers. EIA can be the signal to the developer of potential conflict; wise developers may use the process to negotiate 'environmental gain' solutions, which may eliminate or offset negative environmental impacts, reduce local opposition and avoid costly public inquiries. This can be seen in the wider and contemporary context of corporate social responsibility (CSR) being increasingly practised by major businesses (Crane *et al.* 2008).

1.3.3 A vehicle for stakeholder consultation and participation

Development actions may have wide-ranging impacts on the environment, affecting many different groups in society. There is increasing emphasis by government at many levels on the importance of consultation and participation by key stakeholders in the planning and development of projects; see for example the 'Aarhus Convention' (UNECE 2000) and the EC Public Participation Directive (CEC 2003b). EIA can be a very useful vehicle for engaging with communities and stakeholders, helping those potentially affected by a proposed development to be much better informed and to be more fully involved in the planning and development process.

1.3.4 An instrument for sustainable development

Existing environmentally harmful developments have to be managed as best as they can. In extreme cases, they may be closed down, but they can still leave residual environmental problems for decades to come. It would be much better to mitigate the harmful effects in advance, at the planning stage, or in some cases avoid the particular development altogether. Prevention is better than cure. This is the theme of the pioneering US and EC legislation on EIA. For example, the preamble to the 1985 EC EIA Directive includes 'the best

environmental policy consists in preventing the creation of pollution or nuisances at source, rather than subsequently trying to counteract their effects' (CEC 1985). This of course leads on to the fundamental role of EIA as an instrument for sustainable development – a role some writers have drawn attention to as one often more hidden than it should be when EIA effectiveness is being assessed (Jay *et al*. 2007).

The nature of sustainable development

Economic development and social development must be placed in their environmental contexts. The classical work by Boulding (1966) vividly portrays the dichotomy between the 'throughput economy' and the 'spaceship economy' (Figure 1.2). The economic goal of increased *gross national product* (GNP), using more inputs to produce more goods and services, contains the seeds of its own destruction. Increased output brings with it not only goods and services, but also more waste products. Increased inputs demand more resources. The natural environment is the 'sink' for the wastes and the 'source' for the resources. Environmental pollution and the depletion of resources are invariably the ancillaries to economic development.

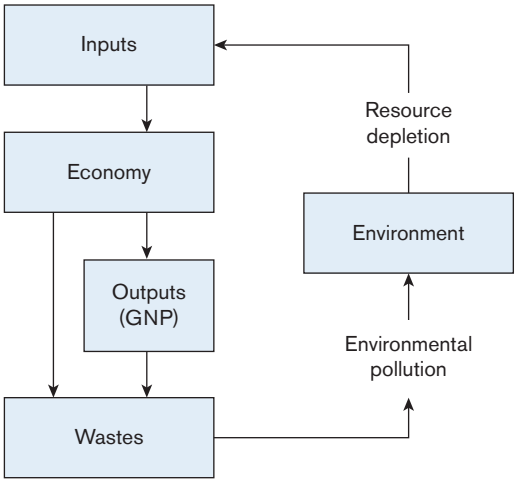


Figure 1.2

The economic development process in its environmental context (adapted from Boulding 1966)

The interaction of economic and social development with the natural environment and the reciprocal impacts between human actions and the biophysical world have been recognized by governments from local to international levels, and attempts have been made to manage the interaction better. However towards the end of the first decade of the twentieth-first century, the European Environment Agency report, *European Environment – State and Outlook 2010* (EEA 2010), still showed some good progress mixed with remaining fundamental challenges, with potentially very serious consequences for the quality of the environment. For example, while greenhouse gas emissions have been cut and the EU is on track to reach a reduction target of 20 per cent by 2020, the Member States still produced close to 5 billion tonnes of CO_2 equivalent emissions in 2008. Similarly while Europe's waste management has shifted steadily from landfill to recycling and prevention, still half of the 3 billion tonnes of total waste generated in the EU-27 in 2006 was landfilled. In nature and biodiversity, Europe has expanded its Natura 2000 network of protected areas to cover 18 per cent of EU land, but missed its 2010 target to halt biodiversity loss. Europe's freshwaters are affected by water scarcity, droughts, floods, physical modifications and the continuing presence of a range of pollutants. Both ambient air and water quality remain inadequate and health impacts are widespread. We also live in an interconnected world. European policy-makers aren't only contending with complex systematic interactions within Europe. There are also unfolding global drivers of change that are likely to affect Europe's environment, and many are beyond Europe's control. Some environmental trends are likely to be even more pronounced in developing countries, where, because population growth is greater and current living standards lower, there will be more pressure on environmental resources.

The 1987 Report of the UN World Commission on Environment and Development (usually referred to as the Brundtland Report, after its chairwoman) defined sustainable development as 'development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs' (UN World Commission on Environment and Develop-

ment 1987). Sustainable development means handing down to future generations not only 'man-made capital' (such as roads, schools and historic buildings) and 'human capital' (such as knowledge and skills), but also 'natural/environmental capital' (such as clean air, fresh water, rainforests, the ozone layer and biological diversity). The Brundtland Report identified the following chief characteristics of sustainable development: it maintains the quality of life, it maintains continuing access to natural resources and it avoids lasting environmental damage. It means living on the earth's income rather than eroding its capital (DoE *et al.* 1990). In addition to a concern for the environment and the future, Brundtland also emphasizes participation and equity, thus highlighting both inter- and intra-generational equity. This definition is much wider than ecology and the natural environment; it entails social organization of intra- and inter-generational equity. Importance is also assigned to economic and cultural aspects, such as preventing poverty and social exclusion, concern about the quality of life, attention to ethical aspects of human well being, and systematic organization of participation by all concerned stakeholders.

There is, however, a danger that 'sustainable development' becomes a weak catch-all phrase; there are already many alternative definitions. Holmberg and Sandbrook (1992) found over 70 definitions of sustainable development. Redclift (1987) saw it as 'moral convictions as a substitute for thought'; to O'Riordan (1988) it was 'a good idea which cannot sensibly be put into practice'. But to Skolimowski (1995), sustainable development

> . . . struck a middle ground between more radical approaches which denounced all development, and the idea of development conceived as business as usual. The idea of sustainable development, although broad, loose and tinged with ambiguity around its edges, turned out to be palatable to everybody. This may have been its greatest virtue. It is radical and yet not offensive.

Readers are referred to Reid (1995), Kirkby *et al.* (1995) and Faber *et al.* (2005) for an overview of the concept, responses and ongoing debate.

Over time, 'sustainability' has evolved as a partial successor to the term 'sustainable development' (although they can be seen as synonymous), partly because the latter has become somewhat ill used (for example, governments seeking to equate sustainable development with sustained growth, firms seeking to equate it with sustained profits).[2] However, despite the global acceptance of the 'sustainability/sustainable development' concept, its scope and nature are a somewhat contested and confused territory (Faber *et al.* 2005). There are numerous definitions, but a much-used one is that of the triple bottom line (TBL), reflecting the importance of environmental, social and economic factors in decision-making, although it is important to go beyond that to emphasize the importance of integration and synergies between factors (Figure 1.3); however the assessment of such synergies presents particular challenges. Figure 1.4 emphasizes that within this three-element definition of sustainability, there is an important hierarchy. The environment and its natural systems are the foundation to any concept of sustainability. We cannot survive without the 'goods and services' provided by Earth's natural and physical systems – breathable air, drinkable water and food. Living on Earth, we need social systems to provide social justice, security, cultural identity and a sense of place. Without a well-functioning social system, an economic system cannot be productive.

Institutional responses to sustainable development

Institutional responses to meet the goal of sustainable development are required at several levels. A *global response* is needed for issues of global concern, such as ozone-layer depletion, climate change, deforestation and biodiversity loss. The United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 was an example not only of international concern, but also of the problems of securing concerted action to deal with such issues. Agenda 21, an 800-page action plan for the international community into the twenty-first century, set out what nations should do to achieve sustainable development. It included topics such as biodiversity, desertification, deforestation, toxic

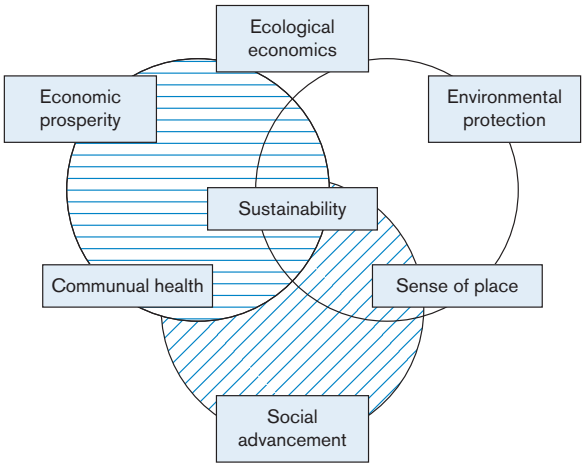


Figure 1.3

Integrating environmental, social and economic dimensions of sustainability

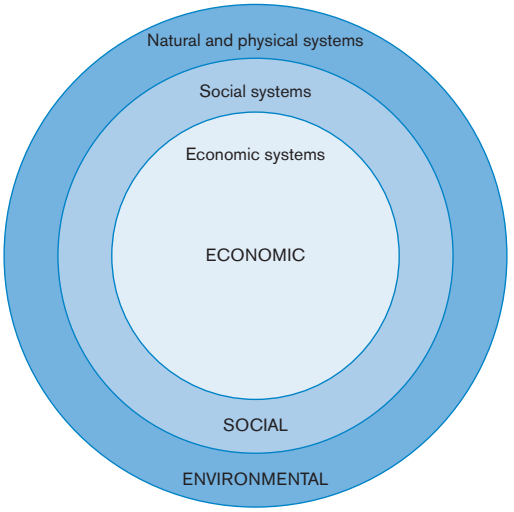


Figure 1.4

An alternative (hierarchical) perspective on the dimensions of sustainability

wastes, sewage, oceans and the atmosphere. For each of its 115 programmes, the need for action, the objectives and targets to be achieved, the activities to be undertaken, and the means of implementation are all outlined. Agenda 21 offered policies and programmes to achieve a sustainable balance between consumption, population and Earth's life-supporting capacity. Unfortunately it was not legally binding, being dependent on national governments, local governments and others to implement most of the programmes.

The Johannesburg Earth Summit of 2002 re-emphasized the difficulties of achieving international commitment on environmental issues. While there were some positive outcomes – for example, on water and sanitation (with a target to halve the number without basic sanitation – about 1.2 billion – by 2015), on poverty, health, sustainable consumption and on trade and globalization – many other outcomes were much less positive. Delivering the Kyoto Protocol on legally enforceable reductions of greenhouse gases

continued to be difficult; the results of the 2009 Copenhagen climate conference fell short of the EU's goal of progress towards the finalization of an ambitious and legally binding global climate treaty to succeed the Kyoto Protocol in 2013 (Wilson and Piper 2010). Similarly, we hear regularly of the continuing loss of global biodiversity and of natural resources, and on the challenges of delivering human rights in many countries. All, of course, is now complicated further by the severe challenges and uncertainties of the serious global economic situation. Together, such problems severely hamper progress on sustainable development.

Within the EU, four Community Action Programmes on the Environment were implemented between 1972 and 1992. These gave rise to specific legislation on a wide range of topics, including waste management, the pollution of the atmosphere, the protection of nature and EIA. The Fifth Programme, 'Towards sustainability' (1993–2000), was set in the context of the completion of the Single European Market (CEC 1992). The latter, with its emphasis on major changes in economic development resulting from the removal of all remaining fiscal, material and technological barriers between Member States, could pose additional threats to the environment. The Fifth Programme recognized the need for the clear integration of performance targets – in relation to environmental protection – for several sectors, including manufacturing, energy, transport and tourism. EU policy on the environment would be based on the 'precautionary principle' that preventive action should be taken, that environmental damage should be rectified at source and that the polluter should pay. Whereas previous EU programmes relied almost exclusively on legislative instruments, the Fifth Programme advocated a broader mixture, including 'market-based instruments', such as the internalization of environmental costs through the application of fiscal measures, and 'horizontal, supporting instruments', such as improved baseline and statistical data and improved spatial and sectoral planning.

The Sixth Programme, *Our future, our choice (2001–12)*, built on the broader approach introduced in the previous decade. It recognized that sustainable development has social and economic as well as physical environmental dimensions, although the focus is on four main priority issues: tackling climate change, protecting nature and biodiversity, reducing human health impacts from environmental pollution, and ensuring the sustainable management of natural resources and waste. It also recognized the importance of empowering citizens and changing behaviour, and of 'greening land-use planning and management decisions'.

> The Community directive on EIA and (the then) proposal on SEA, which aim to ensure that the environmental implications of planned infrastructure projects and planning are properly addressed, will also help ensure that the environmental considerations are better integrated into planning decisions. (CEC 2001)

The EC has not yet decided on the nature of a possible Seventh Programme, including the key role of climate change – either as within the EU environmental policy or as having a more overarching role in the Commission's organization.

In the UK, the publication of *This common inheritance: Britain's environmental strategy* (DoE *et al*. 1990) provided the country's first comprehensive White Paper on the environment. The report included a discussion of the greenhouse effect, town and country, pollution control, and awareness and organization with regard to environmental issues. Throughout it emphasized that responsibility for our environment should be shared between the government, business and the public. The range of policy instruments advocated included legislation, standards, planning and economic measures. The last, building on work by Pearce *et al*. (1989), included charges, subsidies, market creation and enforcement incentives. The report also noted, cautiously, the recent addition of EIA to the 'toolbox' of instruments. Subsequent UK government reports, such as *Sustainable development: the UK strategy* (HMG 1994), recognized the role of EIA in contributing to sustainable development and raised the EIA profile among key user groups. The UK government reports also reflect the extension of the scope of sustainable development to include social, economic and

environmental factors. This is reflected in the UK Strategy for Sustainable Development, *A better quality of life* (DETR 1999a), with its four objectives of:

- social progress which recognizes the needs of everyone;
- effective protection of the environment;
- prudent use of natural resources; and
- maintenance of high and stable levels of economic growth and employment.

To measure progress, the UK government published a set of sustainable development indicators, including a set of 15 key headline indicators (DETR 1999b). It also required a high-level sustainable development framework to be produced for each English region (see, for example, *A better quality of life in the South East*, SEERA, 2001).

Planning Policy Statement 1 (PPS1, DCLG 2005) reinforced the commitment to sustainable development. 'Sustainable development is the core principle underpinning planning. At the heart of sustainable development is the simple idea of ensuring a better quality of life for everyone, now and for future generations.' This was further reinforced and developed in an update of the national strategy, *Securing the future: delivering the UK sustainable development strategy* (DEFRA 2005), in which the UK government introduced a revised set of guiding principles, priorities for action and 20 key headline indicators, with a focus on delivery. The guiding principles are:

- living within environmental limits;
- ensuring a strong, healthy and just society;
- achieving a sustainable economy;
- promoting good governance; and
- using sound science responsibly.

The good governance principle adds an important fourth pillar to the other three pillars (environmental, social and economic) of sustainable development, shifting from a triple to a quadruple bottom line (QBL) approach. Good governance, at all levels from central government to the individual, is needed to foster the integration of the three other pillars. Again, EIA can be a useful vehicle for such integration.

1.4 Projects, environment and impacts

1.4.1 The nature of major projects

As noted in Section 1.2, EIA is relevant to a broad spectrum of development actions, including policies, plans, programmes and projects. The focus here is on projects, reflecting the dominant role of project EIA in practice. The strategic environmental assessment (SEA) and sustainability appraisal (SA) of the 'upper tiers' of development actions are considered further in Chapter 11. The scope of projects covered by EIA is widening, and is discussed further in Chapters 3 and 4. Traditionally, project EIA has applied to major projects; but what are major projects, and what criteria can be used to identify them? One could take Lord Morley's approach to defining an elephant: it is difficult, but you easily recognize one when you see it. In a similar vein, the acronym LULU (locally unacceptable land uses) has been applied in the USA to many major projects, such as in energy, transport and manufacturing, clearly reflecting the public perception of the potential negative impacts associated with such developments. There is no easy definition, but it is possible to highlight some important characteristics (see Plate 1.1 and Table 1.2).

Most large projects involve considerable investment. In the UK context, 'megaprojects' such as the Channel Tunnel and the associated Rail Link, London Heathrow Terminal 5, the Olympic 2012 project, motorways (and their widening), nuclear power stations, gas-fired power stations and renewable energy projects (such as major offshore wind farms and the proposed Severn Barrage) constitute one end of the spectrum. At the other end may be industrial estate developments, small stretches of road, and various waste-disposal facilities, with considerably smaller, but still substantial, price tags. Such projects often cover large areas and employ many workers, usually in construction, but also in operation for some projects. They also invariably generate a complex array of inter- and intra-organizational activity during the various stages of their lives. The developments may have wide-ranging, long-term and

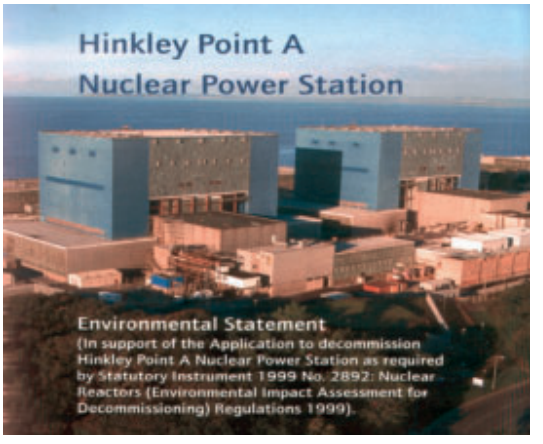
1 Kings Cross, London – urban redevelopment

2 Construction at London 2012 Olympics site

3 Olkiluoto nuclear power plant, Finland

4 The Oresund Bridge connecting Sweden and Denmark

5 Danish offshore wind farm



6 ES for decommissioning Hinkley Point A, UK

Plate 1.1

Some examples of major projects

Source: Magnox Electric (2002); RPS (2004); Symonds/EDAW (2004); Wikimedia.

Table 1.2 Characteristics of major projects

Substantial capital investment
Cover large areas; employ large numbers (construction and/or operation)
Complex array of organizational links
Wide-ranging impacts (geographical and by type)
Significant environmental impacts
Require special procedures
Infrastructure and utilities, extractive and primary (including agriculture); services
Band, point

often very significant impacts on the environment. The definition of significance with regard to environmental effects is an important issue in EIA. It may relate, *inter alia*, to scale of development, to sensitivity of location and to the nature of adverse and beneficial effects; it will be discussed further in later chapters. Like a large stone thrown into a pond, a major project can create significant ripples, with impacts spreading far and wide. In many respects such projects tend to be regarded as exceptional, requiring special procedures. In the UK, these procedures have included public inquiries, hybrid bills that have to be passed through parliament (for example, for the Channel Tunnel) and EIA procedures. Under the 2008 Planning Act (HMG 2008), a special subset of nationally significant infrastructure projects (NSIPs) has been identified, with impacts to be examined by new procedures led by the Infrastructure Planning Commission (IPC) (to become the National Infrastructure Unit of the UK Planning Inspectorate in 2012). NSIPs include major energy projects, transport projects (road, rail and port), water and waste facilities.

Major projects can also be defined according to type of activity. In addition to the infrastructure and utilities, they also include manufacturing and extractive projects, such as petrochemical plants, steelworks, mines and quarries, and services projects, such as leisure developments, out-of-town shopping centres, new settlements and education and health facilities. An EC study adopted a further distinction between band and point infrastructures. Point infrastructure would include, for example, power stations, bridges and harbours; band or linear infrastructure would include electricity transmission lines, roads and canals (CEC 1982).

A major project also has a planning and development life cycle, including a variety of stages. It is important to recognize such stages because impacts can vary considerably between them. The main stages in a project's life cycle are outlined in Figure 1.5. There may be variations in timing between stages, and internal variations within each stage, but there is a broadly common sequence of events. In EIA, an important distinction is between 'before the decision' (stages A and B) and 'after the decision' (stages C, D and E). As noted in Section 1.2, the monitoring and auditing of the implementation of a project following approval are often absent from the EIA process.

Projects are initiated in several ways. Many are responses to market opportunities (e.g. a holiday village, a sub-regional shopping centre, a gas-fired power station; a wind farm); others may be seen as necessities (e.g. the Thames Barrier); others may have an explicit prestige role (e.g. the programme of Grands Travaux in Paris including the Bastille Opera, Musée d'Orsay and Great Arch). Some major projects are public-sector initiatives, but with the move towards privatization in many countries, there has been a move towards private sector funding, exemplified in the UK by such projects as the North Midlands Toll Road, the Channel Tunnel, and now most major utility energy, water and waste projects. The initial planning stage A may take several years, and lead to a specific proposal for a particular site. It is at stage B that the various control and regulatory procedures, including EIA, normally come into play. The construction stage can be particularly disruptive, and may last up to 10 years for some projects. Major projects invariably have long operational lives, although extractive projects can be short compared with infrastructure projects. The environmental impact of the eventual closedown/decommissioning of a facility should not be forgotten; for nuclear power facilities it is a major undertaking. Figure 1.6 shows how the stages in the life cycles of different kinds of project may vary.

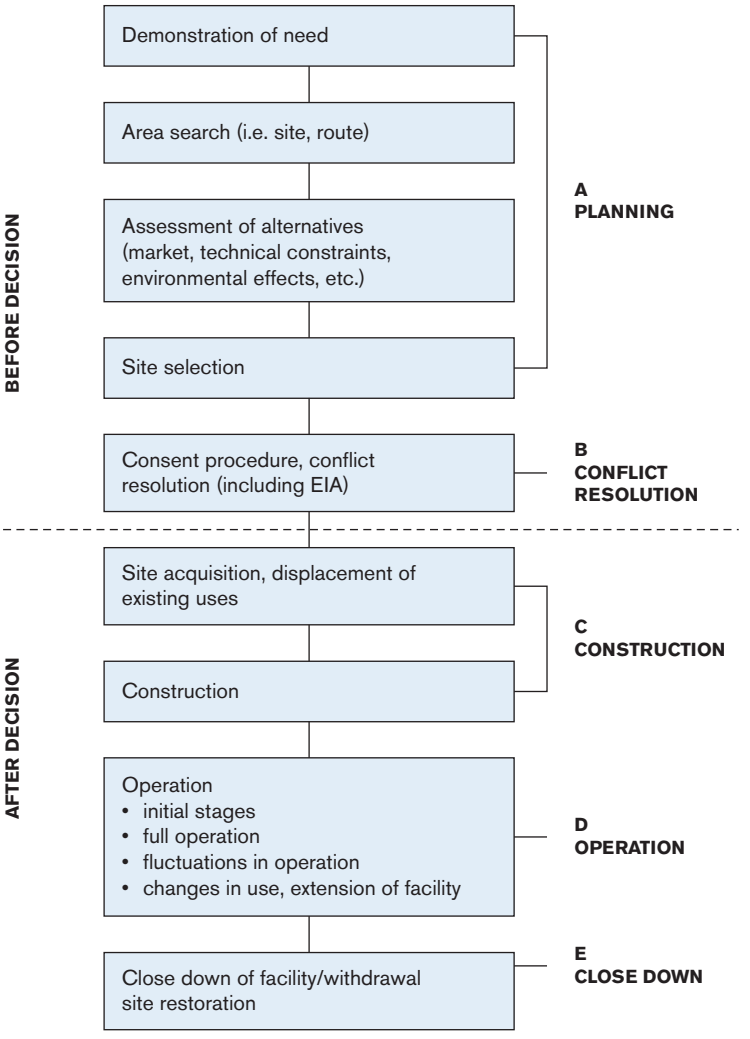


Figure 1.5

Generalized planning and development life cycle for major projects (with particular reference to impact assessment on host area)

Source: Adapted from Breese *et al.* 1965

1.4.2 Dimensions of the environment

The environment can be structured in several ways, including components, scale/space and time. A narrow definition of environmental components would focus primarily on the biophysical environment. For example, the UK Department of the Environment (DoE) used the term to include all media susceptible to pollution, including: air, water and soil; flora, fauna and human beings; landscape, urban and rural conservation; and the built heritage (DoE 1991). The DoE checklist of environmental components is outlined in Table 1.3. However, as already noted in Section 1.2, the environment has important economic and socio-cultural dimensions. These include economic structure, labour markets, demography, housing, services (education, health, police, fire, etc.), lifestyles and values; and these are added to the checklist in Table 1.3. This wider definition is more in line with international definitions, as noted by the IAIA definition of EIA in 1.2.1. Similarly, an Australian definition notes, 'For the purposes of EIA, the meaning of environment incorporates physical, biological, cultural, economic and social factors' (ANZECC 1991).

The environment can also be analysed at various scales (Figure 1.7). Many of the spatial impacts of projects affect the local environment, although the nature of 'local' may vary according to the

Figure 1.6

Broad variations in life cycle stages between different types of project

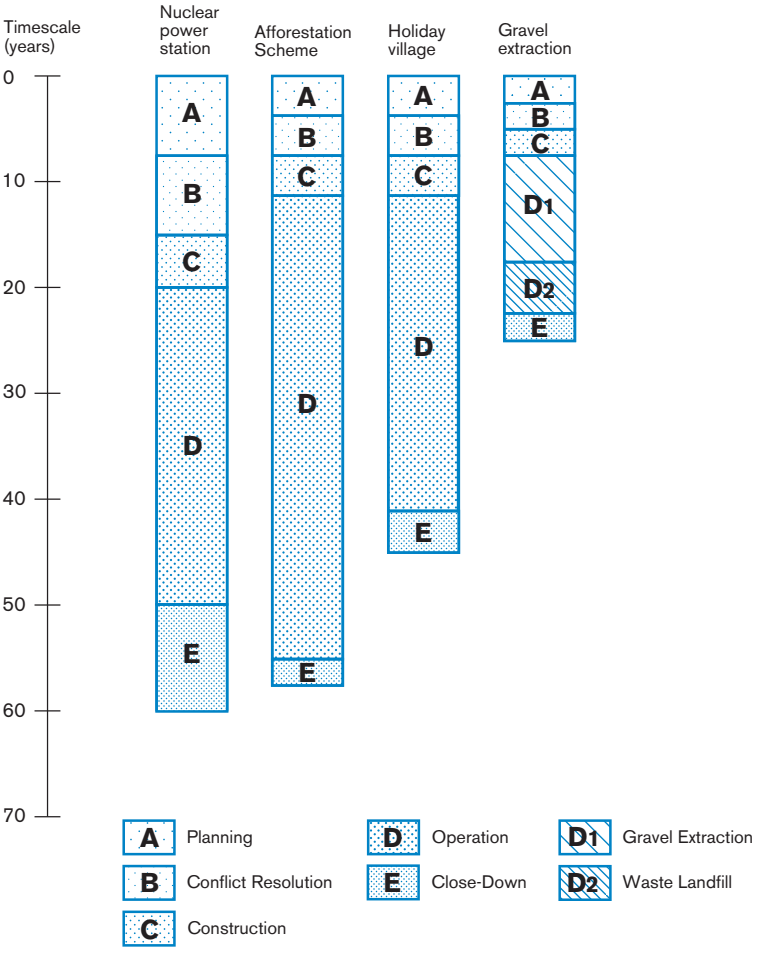


Table 1.3 Environmental components

Physical environment	
Air and atmosphere	Air quality
Water resources and water bodies	Water quality and quantity
Soil and geology	Classification, risks (e.g. erosion, contamination)
Flora and fauna	Birds, mammals, fish, etc.; aquatic and terrestrial vegetation
Human beings	Physical and mental health and well-being
Landscape	Characteristics and quality of landscape
Cultural heritage	Conservation areas; built heritage; historic and archaeological sites; other material assets
Climate	Temperature, rainfall, wind, etc.
Energy	Light, noise, vibration, etc.
Socio-economic environment	
Demography	Population structure and trends
Economic base – direct	Direct employment; labour market characteristics; local and non-local trends
Economic base – indirect	Non-basic and services employment; labour supply and demand
Housing; transport; recreation	Supply and demand
Other local services	Supply and demand of services: health, education, police, etc.
Socio-cultural	Lifestyles, quality of life; social problems; community stress and conflict

Source: adapted from DoE 1991; DETR 2000; CEC 2003a

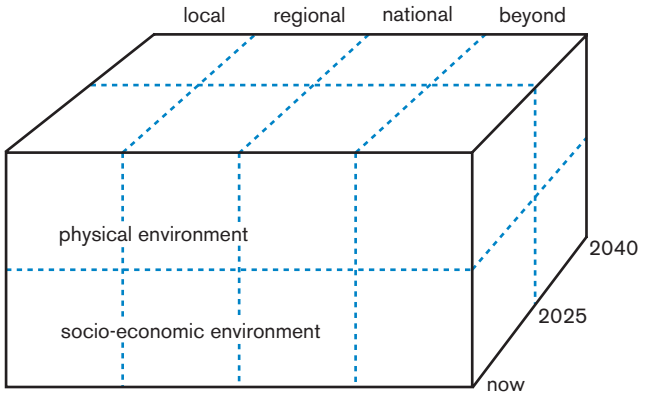


Figure 1.7

Environment: components, scale and time dimensions

aspect of environment under consideration and to the stage in a project's life. However, some impacts are more than local. Traffic noise, for example, may be a local issue, but changes in traffic flows caused by a project may have a regional impact, and the associated CO_2 pollution contributes to the global greenhouse problem. The environment also has a time dimension. Baseline data on the state of the environment are needed at the time a project is being considered. There has been a vast increase in data available on the Internet, from the local to the national level (e.g. in the UK via local authority development plans and national statistical sources, such as the e-Digest of Environment Statistics produced by the Department of Environment, Food and Rural Affairs). For some areas such data may be packaged in tailor-made state-of-the-environment reports and audits. See Chapters 5 and 12, and Appendix 6 for further guides to data sources. For all data it is important to have a time-series highlighting trends in environmental quality, as the environmental baseline is constantly changing, irrespective of any development under consideration, and requires a dynamic rather than a static analysis

1.4.3 The nature of impacts

The environmental impacts of a project are those resultant changes in environmental parameters, in space and time, compared with what would have happened had the project not been undertaken. The parameters may be any of the type of environmental receptors noted previously: air quality, water quality, noise, levels of local unemployment and crime, for example. Figure 1.8 provides a simple illustration of the concept.

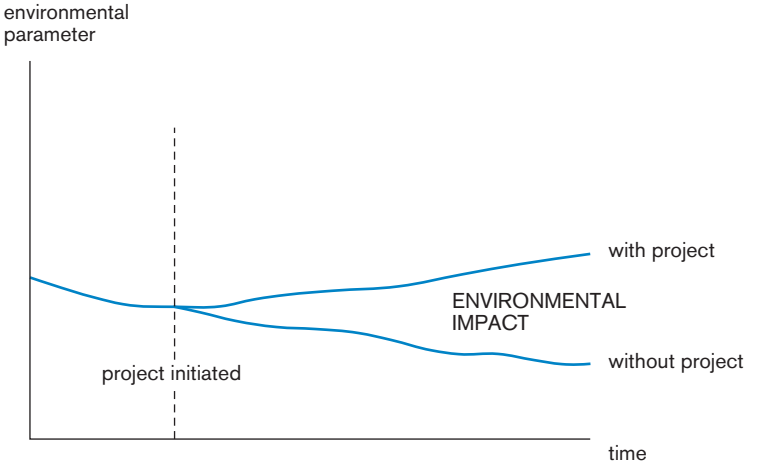


Figure 1.8

The nature of an environmental impact

Table 1.4 Types of impact

Physical and socio-economic
Direct and indirect
Short-run and long-run
Local and strategic (including regional, national and beyond)
Adverse and beneficial
Reversible and irreversible
Quantitative and qualitative
Distribution by group and/or area
Actual and perceived
Relative to other developments; cumulative

Table 1.4 provides a summary of some of the types of impact that may be encountered in EIA. The biophysical and socio-economic impacts have already been noted. These are sometimes seen as synonymous with adverse and beneficial, respectively. Thus, new developments may produce harmful wastes but also produce much needed jobs in areas of high unemployment. However, the correlation does not always apply. A project may bring physical benefits when, for example, previously polluted and derelict land is brought back into productive use; similarly, the socio-economic impacts of a major project on a community could include pressure on local health services and on the local housing market, and increases in community conflict and crime. Projects may also have immediate and direct impacts that give rise to secondary and indirect impacts later. A reservoir based on a river system not only takes land for the immediate body of water but also may have severe downstream implications for flora and fauna and for human activities such as fishing and sailing. The direct and indirect impacts may sometimes correlate with short-run and long-run impacts. For some impacts the distinction between short-run and long-run may also relate to the distinction between a project's construction and its operational stage; however, other construction-stage impacts, such as change in land use, are much more permanent. Impacts also have a spatial dimension. One distinction is between local and strategic, the latter covering impacts on areas beyond the immediate locality. These are often regional, but may sometimes be of national or even international significance.

Environmental resources cannot always be replaced; once destroyed, some may be lost forever. The distinction between reversible and irreversible impacts is a very important one, and the irreversible impacts, not susceptible to mitigation, can constitute particularly significant impacts in an EIA. It may be possible to replace, compensate for or reconstruct a lost resource in some cases, but substitutions are rarely ideal. The loss of a resource may become more serious later, and valuations need to allow for this. Some impacts can be quantified, others are less tangible. The latter should not be ignored. Nor should the distributional impacts of a proposed development be ignored. Impacts do not fall evenly on affected parties and areas. Although a particular project may be assessed as bringing a general benefit, some groups and/or geographical areas may be receiving most of any adverse effects, the main benefits going to others elsewhere. There is also a distinction between actual and perceived impacts. Subjective perceptions of impacts may significantly influence the responses and decisions of people towards a proposed development. They constitute an important source of information, to be considered alongside more objective predictions of impacts.

> Social constructions are not mere perceptions or emotions, to be distinguished from reality; rather, how we view a social situation determines how we behave. Furthermore, social constructions of reality are characteristic of all social groups, including the agencies that are attempting to implement change as well as the communities that are affected. (IOCGP 2003)

Finally, all impacts should be compared with the 'do-nothing' situation, and the state of the environment predicted without the project. This can be widened to include comparisons with anticipated impacts from alternative development scenarios for an area. Some projects may also have cumulative impacts in combination with other development actions, current and future; for example, the impacts of several wind farms in an area, or the build-up of several major, but different, developments (e.g. port; power station; steel works; waste water facility) around an estuary. The important area of cumulative impacts is discussed further in Chapters 9 and 12.

We conclude on a semantic point: the words 'impact' and 'effect' are widely used in the literature and legislation on EIA, but it is not always clear whether they are interchangeable or should be used only for specifically different meanings. In the United States, the regulations for implementing the National Environmental Policy Act (NEPA) expressly state that 'effects and impacts as used in these regulations are synonymous'. This interpretation is widespread, and is adopted in this text. But there are other interpretations relating to timing and to value judgements. Catlow and Thirlwall (1976) make a distinction between effects that are 'the physical and natural changes resulting, directly or indirectly, from development' and impacts that are 'the consequences or end products of those effects represented by attributes of the environment on which we can place an objective or subjective value'. In contrast, an Australian study (CEPA 1994) reverses the arguments, claiming that 'there does seem to be greater logic in thinking of an impact resulting in an effect, rather than the other way round'. Other commentators have introduced the concept of value judgement into the differentiation. Preston and Bedford (1988) state that 'the use of the term "impacts" connotes a value judgement'. This view is supported by Stakhiv (1988), who sees a distinction between 'scientific assessment of facts (effects), and the evaluation of the relative importance of these effects by the analyst and the public (impacts)'. The debate continues!

1.5 Changing perspectives on EIA

1.5.1 The importance of adaptive EIA

The arguments for EIA vary in time, in space and according to the perspective of those involved. From a minimalist defensive perspective, some developers, and still possibly some parts of some governments, might see EIA as a necessary evil, an administrative exercise, something to be gone through that might result in some minor, often cosmetic, changes to a development that would probably have happened anyway. In contrast, for the 'deep ecologists' or 'deep greens', EIA cannot provide total certainty about the environmental consequences of development proposals; they feel that any projects carried out under uncertain or risky circumstances should be abandoned. EIA and its methods must straddle such perspectives on weak and strong sustainability. EIA can be, and now often is, seen as a positive process that seeks a harmonious relationship between development and the environment. The nature and use of EIA will change as relative values and perspectives also change. EIA must adapt, and as O'Riordan (1990) very positively noted over 20 years ago:

> One can see that EIA is moving away from being a defensive tool of the kind that dominated the 1970s to a potentially exciting environmental and social betterment technique that may well come to take over the 1990s . . . If one sees EIA not so much as a technique, rather as a process that is constantly changing in the face of shifting environmental politics and managerial capabilities, one can visualize it as a sensitive barometer of environmental values in a complex environmental society. Long may EIA thrive.

EIA must continue to adapt in our rapidly changing world, a world where there are serious challenges to all the pillars of sustainability. Climate change is now recognized by many governments as the most important challenge of the twenty-first century, necessitating major initiatives – yet progress is sporadic. In recent years the world has also been on the edge of financial meltdown, and has endured serious economic recession, leading to stimulus investment, often through infrastructure projects, but also to drastic measures for deficit reduction. Poverty and social inequalities persist and are deep-seated. But before addressing the changing nature of the impact assessment family, we first consider EIA in its theoretical context.

1.5.2 EIA in its theoretical context

EIA must also be reassessed in its *theoretical context*, and in particular in the context of decision-making theory (see Lawrence 1997, 2000; Bartlett and Kurian, 1999; Weston 2000, 2003). EIA had its

origins in a climate of a rational approach to decision-making in the USA in the 1960s (Caldwell 1988). The focus was on the systematic process, objectivity, a holistic approach, a consideration of alternatives and an approach often seen as primarily linear. This rational approach is assumed to rely on a scientific process in which facts and logic are pre-eminent. In the UK this rational approach was reflected in planning in the writings of, *inter alia*, Faludi (1973), McLoughlin (1969), and Friend and Jessop (1977).

However, other writings on the theoretical context of EIA have recognized the importance of the subjective nature of the EIA process. Kennedy (1988) identified EIA as both a 'science' and an 'art', combining political input and scientific process. More colourfully, Beattie (1995), in an article entitled 'Everything you already know about EIA, but don't often admit', reinforces the point that EIAs are not science; they are often produced under tight deadlines and data gaps, and simplifying assumptions are the norm under such conditions. They always contain unexamined and unexplained value judgements, and they will always be political. They invariably deal with controversial projects, and they have distributional effects – there are winners and losers. EIA professionals should therefore not be surprised, or dismayed, when their work is selectively used by various parties in the process. Leknes (2001) notes that it is particularly in the later stage of decision-making that the findings of EIA are likely to give way to political considerations. Weston (2003) notes the weakening of deference to science, experts and the rational approach. Confidence in decision-making for major projects is eroded by events such as nuclear accidents, chemical spills, numerous environmental disasters, and massive financial and time overruns of projects (Flyberg 2003). The public increasingly fear the consequences of change over which they have little control, and there is more emphasis on risk (see Beck 1992, 2008).

However, in the context of decision-making theory, this recognition of the political, the subjective and value judgement is reflected in a variety of behavioural/participative theories, and is not new. For example, in the 1960s Braybrooke and Lindblom (1963) saw decisions as incremental adjustments, with a process that is not comprehensive, linear and orderly, and is best characterized as 'muddling through'. Lindblom (1980) further developed his ideas through the concept of 'disjointed incrementalism', with a focus on meeting the needs and objectives of society, often politically defined. The importance of identifying and confronting trade-offs, a major issue in EIA, is clearly recognized. The participatory approach includes processes for open communication among all affected parties. The recognition of multiple parties and the perceived gap between government and citizens has stimulated other theoretical approaches, including communicative and collaborative planning (Healey 1996, 1997). This approach draws upon the work of Habermas (1984), Forester (1989) and others. Much attention is devoted to consensus-building, co-ordination and communication, and the role of government in promoting such actions as a means of dealing with conflicting stakeholder interests and achieving collaborative action. Critics of such an approach highlight in particular the lack of regard for power relationships within society, and especially the role of private sector developers – invariably the proponents in EIA.

It is probably now realistic to place the current evolution of EIA somewhere between the rational and behavioural approaches – reflecting elements of both. It does include important strands of rationalism, but there are many participants, and many decision points – and politics, power relationships and professional judgement are often to the fore. In EIA there are many decisions; for example, on whether EIA is needed at all (screening), the scope of the EIA, the alternatives under consideration, project design and redesign, the range of mitigation and enhancement measures, and implementation and monitoring during the 'post-key-decision' stages of the project life cycle (Glasson 1999). This tends to fit well with the classic concept of 'mixed scanning' advocated by Etzioni (1967), utilizing rational techniques of assessment, in combination with more intuitive value judgements, based upon experience and values. The rational–adaptive approach of Kaiser *et al*. (1995) also stresses the importance of a series of steps in decision-making, with both (scientific-based) rationality and (community-informed) participation, moderating the selection of policy options and desired outcomes.

1.5.3 EIA in a rapidly growing Impact Assessment (IA) family

Over the last 40 years, EIA has been joined by a growing family of assessment tools. The IAIA uses the generic term of impact assessment (IA) to encompass the semantic explosion; whereas Sadler (1996) suggested that we should view environmental assessment (EA) as 'the generic process that includes EIA of specific projects, SEA of PPPs, and their relationships to a larger set of impact assessment and planning-related tools'. Whatever the family name, there is little doubt that membership is increasing apace, with a focus on widening the *scope, scale and integration of assessment*. Impact assessment now includes, for example, SIA, HIA, EqIA, TIA, SEA, SA, S&EIA, HRA/AA, EcIA, CIA, plus a range of associated techniques such as RA, LCA, MCA, CBA – and many more. Some of the tools have been led by legislation; others have been more driven by practitioners from various disciplines that have endeavoured to separate out and highlight the theme(s) of importance to their discipline, resulting in thematically focused forms of assessment. Dalal-Clayton and Sadler (2004) rightly observe that 'the alphabet soup of acronyms [and terms] currently makes for a confusing picture'. The various assessment tools are now briefly outlined in terms of scope, scale and integration; most are discussed much further in subsequent chapters.

Scope

Development actions may have impacts not only on the physical environment but also on the social and economic environment. Typically, employment opportunities, services (e.g. health, education), community structures, lifestyles and values may be affected. *Socio-economic impact assessment* or *social impact assessment* (SIA) is regarded in this book as an integral part of EIA. However, in some countries it is (or has been) regarded as a separate process, sometimes parallel to EIA, and the reader should be aware of its separate existence (Carley and Bustelo 1984; Finsterbusch 1985; IAIA 1994; Vanclay 2003). Some domains explicitly use *S&EIA* to denote *Socio-economic and environmental impact assessment*. *Health impact assessment* (*HIA*) has been a particularly important area of growth in recent years, evolving out of the socio-economic strand; its focus is on the effects that a development action may have on the health of its host population (IPHI 2009). A more recent area still is *equality impact assessment* (*EqIA*), which seeks to identify the important distributional impacts of development actions on various groups in society (e.g. by gender, race, age, disability, sexual orientation etc., Downey 2005). Vanclay and Bronstein (1995) and others note several other relevant definitions, based largely on particular foci of specialization and including, for example, transport impact assessment, demographic impact assessment, climate impact assessment, gender impact assessment, psychological impact assessment, noise impact assessment, economic impact assessment, and cumulative impacts assessment (Canter and Ross 2010).

Scale

Strategic environmental assessment (SEA) expands the scale of operation from the EIA of projects to a more strategic level of assessment of programmes, plans and policies (PPPs). Development actions may be for a project (e.g. a nuclear power station), for a programme (e.g. a number of pressurized water reactor (PWR) nuclear power stations), for a plan (e.g. in the town and country planning (T&CP) system in England) or for a policy (e.g. the development of renewable energy). EIA to date has generally been used for individual projects, and that role is the primary focus of this book. But EIA for programmes, plans and policies, otherwise known as SEA, has been introduced in the European Union (EU) since 2004 and is also used in many other countries worldwide (Therivel 2010; Therivel and Partidario 1996; Therivel *et al*. 1992). SEA informs a higher, earlier, more strategic tier of decision-making. In theory, EIA should be carried out in a tiered fashion first for policies, then for plans and programmes, and finally for projects. The focus of SEA has been primarily biophysical, and there are close links with another relatively new area of assessment, *habitats regulation assessment/appropriate assessment (HRA/AA)*, which is required in the EU for projects and plans that may have significant impacts on key Natura 2000 sites of biodiversity. In contrast, a wider approach

to strategic assessment, seeking to include biophysical and socio-economic impacts, is provided by SA. In England this is required for the assessment of the impacts of plans under the T&CP system. In some domains, where there is not a strategic level of assessment or planning, project-level assessment may adopt, to varying degrees, a strategic perspective, with features of either SEA or SA; good examples are provided by mega-projects, such as the major mineral development projects in the remote areas of Australia.

Integration

Hacking and Guthrie (2008) have sought to provide a relational framework (Figure 1.9) to clarify the position of various assessment tools, in the context of planning and decision-making for sustainable development. In addition to scope (referred to as comprehensiveness of coverage) and scale (strategicness of the focus and scope), they also include integratedness of techniques and themes. The latter includes a package of techniques that seek to achieve integration in the assessment process (e.g. between biophysical and socio-economic impacts; Scrase and Sheate 2002); this was termed 'horizontal integration' by Lee (2002). Petts (1999) provides a good overview of some of the techniques that include, for example, *life cycle assessment* (LCA), *cost-benefit analysis* (CBA), *environmental auditing, multi-criteria assessment* (MCA) *and risk assessment* (RA). LCA differs from EIA in its focus not on a particular site or facility, but on a product or system and the cradle-to-grave environmental effects of that product or system (see White *et al*. 1995). In contrast, CBA focuses on the economic impacts of a development, but taking a wide and long view of those impacts. It involves as far as possible the monetization of all the costs and benefits of a proposal. It came to the fore in the UK in relation to major transport projects in the 1960s, but has subsequently enjoyed

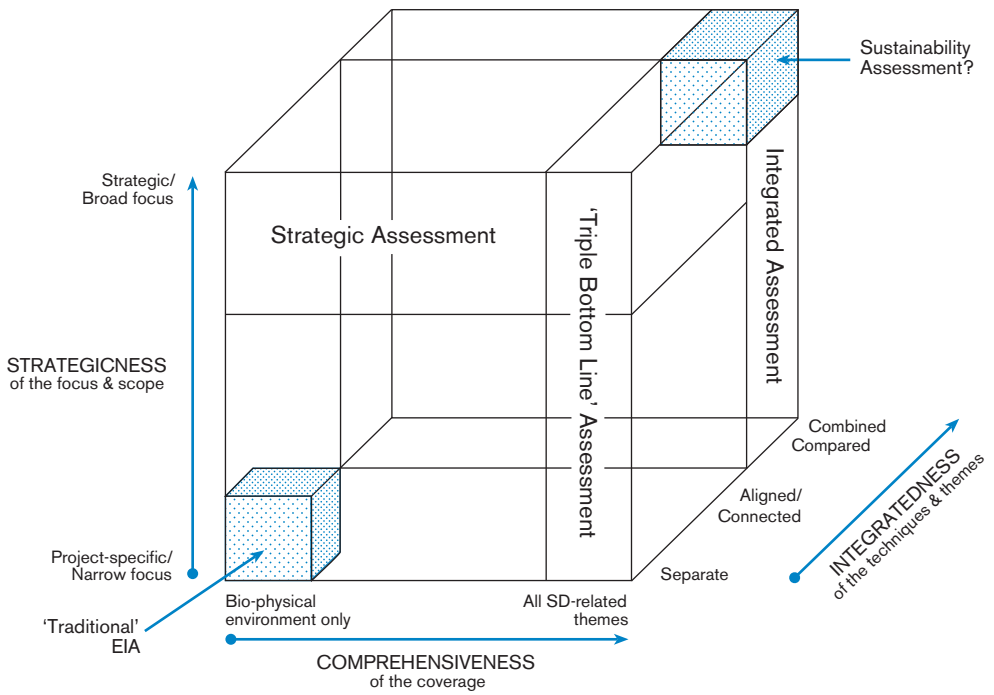


Figure 1.9

A relational framework of SD-focused assessment tools

Source: Hacking and Guthrie 2008

a new lease of life (see Hanley and Splash 1993; Lichfield 1996). Environmental auditing is the systematic, periodic and documented evaluation of the environmental performance of facility operations and practices, and this area has seen the development of procedures, such as the international standard ISO 14001.

Multi-criteria decision assessment (MCDA) covers a collection of approaches, often quantitative, that can be used to help key stakeholders to explore alternative approaches to important decisions by explicitly taking account of multiple criteria (Belton and Stewart 2002); it is quite widely used. *Risk assessment* is another term sometimes found associated with EIA. Partly in response to events such as the chemicals factory explosion at Flixborough (UK), and nuclear power station accidents at Three Mile Island (USA) and Chernobyl (Ukraine), RA developed as an approach to the analysis of risks associated with various types of development. Calow (1997) gives an overview of the growing area of environmental RA and management, and Flyberg (2003) provides a critique of risk assessment in practice. While these tools tend to be more technocentric, they can be seen as complementary to EIA, seeking to achieve a more integrated approach. Thus Chapter 5 explores the potential role of CBA and MCA approaches in EIA evaluation; Chapter 12 develops further the concept of integrated assessment, and explores the role of environmental auditing and LCA in relation to environmental management systems (EMSs).

This brief discussion on changing perspectives, on the theoretical context, associated tools and processes, emphasizes the need to continually reassess the role and operation of EIA and the importance of an adaptive EIA. This will be developed further in several chapters – especially in Part 4.

1.6 Current issues in EIA

Although EIA now has over 40 years of history in the USA, elsewhere the development of concepts and practice is more recent. Development is moving apace in many other countries, including the UK and the other EU Member States. There is much to welcome; Gibson (2002) noted some worldwide trends in EIA, such as that it is earlier in the process, more open and participative, more comprehensive (not just biophysical environment), more mandatory, more closely monitored, more widely applied (e.g. at various levels), more integrative, more ambitious (regarding sustainability objectives) and more humble (recognizing uncertainties, applying precaution). Yet such progress is variable, and has not been without its problems. A number of the current issues in EIA are highlighted here and will be discussed more fully in later chapters.

1.6.1 The nature of methods of assessment

As noted in Section 1.2, some of the main steps in the EIA process (e.g. auditing and monitoring) may be missing from many studies. There may also be problems with the steps that are included. The prediction of impacts raises various conceptual and technical problems. The problem of establishing the environmental baseline position has already been noted. It may also be difficult to establish the dimensions and development stages of a project clearly, particularly for new technology projects. Further conceptual problems include establishing what would have happened in the relevant environment without a project, clarifying the complexity of interactions of phenomena, and especially making trade-offs in an integrated way (i.e. assessing the trade-offs between economic apples, social oranges and physical bananas). Other technical problems relate to data availability and the tendency to focus on the quantitative, and often single, indicators in some areas. There may also be delays and gaps between cause and effect, and projects and policies may discontinue. The lack of auditing of predictive techniques limits the feedback on the effectiveness of methods. Nevertheless, innovative methods are being developed to predict and evaluate impacts, ranging from simple checklists and matrices to complex mathematical models and multi-criteria approaches. It should be noted however that these methods may not be neutral, in the sense that the more complex they are, the more difficult it becomes for the general public to participate in the EIA process.

1.6.2 The quality and efficiency of the EIA process

One assessment of quality is that of the immediate output of the process, the EIS. Many EISs may fail to meet even minimum standards. For example, an early survey by Jones *et al*. (1991) of the EISs published under UK EIA regulations highlighted some shortcomings. They found

> . . . that one-third of the EISs did not appear to contain the required non-technical summary, that, in a quarter of the cases, they were judged not to contain the data needed to assess the likely environmental effects of the development, and that in the great majority of cases, the more complex, interactive impacts were neglected.

The DoE (1996) later suggested that although there had been some learning from experience, many EISs in the UK were still unsatisfactory (see Chapter 8 for further and updated discussion). Quality may vary between types of project. It may also vary between countries supposedly operating under the same legislative framework.

EISs can run the risk of being voluminous, unintegrated, documents that can be difficult for most of the participants in the EIA process. Such outcomes raise various questions about the efficiency of the EIA process. For example, are 'safety first' policies resulting in too many projects being screened for EIA and the EIA scoping stage being too all embracing of potential impacts? Is there too much focus on over-descriptive baseline work and not enough focus on the key impacts that matter? Is the EIS still a set of segregated specialist chapters rather than a well-integrated document? Are the key steps of monitoring and auditing well enough built into the process? Considerations of efficiency, however, can also run counter to considerations of fairness in the process.

1.6.3 The relative roles of participants in the process

The various 'actors' in the EIA process – the developer, the affected parties, the general public and the regulators at various levels of government – have differential access to the process, and their influence on the outcome varies. Some would argue that in countries such as the UK the process is too developer-orientated. The developer or the developer's consultant carries out the EIA and prepares the EIS, and is unlikely to predict that the project will be an environmental disaster. Notwithstanding this, developers themselves are concerned about the potential delays associated with the requirement to submit an EIS. They are also concerned about cost. Details about costs are difficult to obtain. Early estimates (Clark 1984; Hart 1984; Wathern 1988) were of EIA costs of 0.5–2.0 per cent of a project's value. The UK DETR (1997) suggested £35,000 as an appropriate median figure for the cost of undertaking an EIA under the EC regulations, but for major projects the monetary figure can be much higher than this. A more recent EU commissioned study evaluating the EIA Directive indicated that, as a share of the project costs, EIAs tend to range from an upper limit of 1 per cent for small projects to 0.1 per cent for larger projects (CEC 2006).

Procedures for and the practice of public participation in the EIA process vary between, and sometimes within, countries, from the very comprehensive to the very partial and largely cosmetic. An important issue is the stages in the EIA process to which the public have access. Government roles in the EIA process may be conditioned by caution at extending systems, by resource considerations and by limited experience and expertise for what in some domains is still a relatively new and developing area. A central government may offer only limited guidance on best practice, and make inconsistent decisions. A local government may find it difficult to handle the scope and complexity of the content of EISs, especially for major projects.

1.6.4 The effectiveness of the EIA process

While EIA systems are now well established in many countries of the world, there is considerable soul-searching about how effective it all is, whether EIA is achieving its purposes – as set out in Section 1.3? There is also considerable debate about *how we assess EIA effectiveness*. There can be various (inter-related) dimensions to this. For example, a

procedural/narrow approach would focus on how well EIA is being carried out according to its own procedural requirements in the country of concern; a procedural/wider approach might consider the extent to which EIA is contributing to increased environmental awareness and learning among the array of key stakeholders. These dimensions are partly covered in the preceding sections (1.6.1–1.6.3). However, more fundamental, in relation to EIA core purposes, are substantive approaches. For example, a substantive/narrow approach would concentrate on whether EIA is having a direct impact on the quality of planning decisions and the nature of developments. A substantive/wider approach would focus on the fundamental question of whether EIA is maintaining, restoring, and enhancing environmental quality; is it contributing towards more sustainable development? These issues of EIA effectiveness are examined in various sections, and particularly in Chapter 8.

1.6.5 Beyond the decision

Many EISs are for one-off projects, and there may be little incentive for developers to audit the quality of the assessment predictions and to monitor impacts as an input to a better assessment for the next project. Yet EIA up to and no further than the decision on a project is a very partial exercise. It is important to ensure that the required mitigation and enhancement measures are implemented in practice. In some areas of the world (e.g. California, Western Australia, the Netherlands, and Hong Kong to mention just a few), the monitoring of impacts is mandatory, and monitoring procedures must be included in an EIS. It is also important to take the opportunity for a cyclical learning process, auditing predicted outcomes as fully as possible – to check the accuracy of predictions. The relationship with environmental management processes is another vital area of concern; EISs can effectively lead to environmental management plans for project implementation – but, again, good practice is patchy. The extension of such approaches constitutes another significant current issue in the project-based EIA process.

1.6.6 Managing the widening scope and complexity of IA activity

As noted in Section 1.5, the IA family has grown apace, especially in recent years. How can this complexity be managed? For example, what should be the norm for the content of a contemporary EIS? There is a strong case for widening the dimensions of the environment under consideration to include socio-economic impacts more fully. The trade-off between the often adverse biophysical impacts of a development and the often beneficial socio-economic impacts can constitute the crucial dilemma for decision-makers. Coverage can also be widened to include other types of impacts only very partially covered to date. Should the EIS include social, health and equality elements as standard, or should these be separate activities, and documents? In a similar vein, which projects should have EIAs? For example, project EIA may be mandatory only for a limited set of major projects, but in practice many others may be included. Case law is now building up in many countries, but the criteria for the inclusion or exclusion of a project for EIA may not always be clear.

As also noted in Section 1.5, the SEA/SA of PPPs represents a logical extension of project assessment. SEA/SA can cope better with cumulative impacts, alternatives and mitigation measures than project assessment. But what is the nature of the relationship between the different scales of impact assessment? Strategic levels of assessment of plans and programmes should provide useful frameworks for the more site-specific project assessments, hopefully reducing workload and leading to more concise and effective EIAs. But the anticipated tiered relationship may be more in theory than practice, leading to unnecessary and wasteful duplication of activity.

1.7 An outline of subsequent parts and chapters

This book is in four parts. The first establishes the context of EIA in the growth of concern about environmental issues and in relevant legislation, with particular reference to the UK and the EU.

Following from this first chapter, which provides an introduction to EIA and an overview of principles, Chapter 2 focuses on the origins of EIA under the US NEPA of 1969, on interim developments in the UK, and on the subsequent introduction of EC Directive 85/337 and subsequent amendments and developments. The details of the UK legislative framework for EIA, under T&CP and other legislation are discussed in Chapter 3.

Part 2 provides a rigorous step-by-step approach to the EIA process. This is the core of the text. Chapter 4 covers the early start-up stages, establishing a management framework, clarifying the type of developments for EIA, and outlining approaches to scoping, the consideration of alternatives, project description, establishing the baseline and identifying impacts. Chapter 5 explores the central issues of prediction, the assessment of significance and impact mitigation and enhancement. The approach draws out broad principles affecting prediction exercises, exemplified with reference to particular cases. Chapter 6 provides coverage of an important issue identified above: participation in the EIA process. Communication in the EIA process, EIS presentation and EIA review are also covered in this chapter. Chapter 7 takes the process beyond the decision on a project and examines the importance of, and approaches to, monitoring and auditing in the EIA process.

Part 3 exemplifies the process in practice. Chapter 8 provides an overview of UK practice to date, including quantitative and qualitative analyses of the EISs prepared. Chapter 9 provides a review of EIA practice in several key sectors, including energy, transport, waste management and tourism. A feature of the chapter is the provision of a set of case studies of recent and topical EIA studies from the UK and overseas, illustrating particular features of and issues in the EIA process. Chapter 10 draws on comparative experience from developed countries (e.g. Canada and Australia) and from a number of countries from the developing and emerging economies (Peru, China, Benin and Poland) – presented to highlight some of the strengths and weaknesses of other systems in practice. The important role of international agencies in EIA practice – such as the European Bank for Reconstruction and Development and the World Bank – is also discussed in this chapter.

Part 4 looks to the future; it illuminates many of the issues noted in Section 1.6. The penultimate chapter discusses the need for SEA and some of its limitations. It reviews the status of SEA in the USA, European Union and UNECE, and China. It then discusses in more detail how the European SEA Directive is being implemented in the UK. Chapter 12, the final chapter, focuses on improving the effectiveness of, and the prospects for, project-based EIA. It considers the array of perspectives on change from the various participants in the EIA process, followed by a consideration of possible developments in some important areas of the EIA process and in the nature of EISs. The chapter concludes with a discussion of the parallel and complementary development of environmental management systems and audits. Together, these topics act as a kind of action list for future improvements to EIA. A set of appendices provide details of legislation and practice, and websites and journals not considered appropriate to the main text.

SOME QUESTIONS

The following questions are intended to help the reader focus on the important issues of this chapter, and to start building some understanding of the principles of EIA.

1 Revisit the definitions of EIA given in this chapter. Which one do you prefer and why?
2 Some steps in the EIA process have proved to be more difficult to implement than others. From your initial reading, identify which these might be and consider why they might have proved to be problematic.
3 Taking a few recent examples of environmental impact statements for projects in your country, review their structure and content against the outline information in this chapter. Do they raise any issues on structure and content?
4 What are the differences between (i) project screening and project scoping, and (ii) impact mitigation and impact enhancement?
5 Review the purposes for EIA, and assess their importance from your own perspective.
6 Apply the characteristics of major projects set out in Table 1.2 to two major projects with which you are familiar. Are there any important variations between the applications? If so, can you explain why?
7 Similarly, for one of the projects identified in Q6, plot the likely stages in its life cycle – applying approximate timings as far as possible.
8 What do you understand by a multi-dimensional approach to the environment, in EIA?
9 What is an impact in EIA? Do you see any difference between impacts and effects?
10 What do you understand by (i) irreversible impacts, (ii) cumulative impacts and (iii) distributional impacts, in EIA?
11 Why should it be important to adopt an adaptive approach to EIA?
12 This question may be a little deep at this stage of your reading, but we will ask it all the same: do you think it is reasonable to consider the EIA process as a rational, linear scientific process?
13 What are the main differences between EIA and SEA?
14 What might be some of the reasons for the widening scope of EIA?
15 What do you understand by 'beyond the decision' in EIA?
16 How might we measure (i) the efficiency, and (ii) the effectiveness of EIA?

Notes

1 In some domains the EIS is referred to more simply as an ES; these terms are used interchangeably in this book.
2 Turner and Pearce (1992) and Pearce (1992) have drawn attention to alternative interpretations of maintaining the capital stock. A policy of conserving the whole capital stock (man-made, human and natural) is consistent with running down any part of it as long as there is substitutability between capital degradation in one area and investment in another. This can be interpreted as a 'weak sustainability' position. In contrast, a 'strong sustainability' position would argue that it is not acceptable to run down environmental assets, for several reasons: uncertainty (we do not know the full consequences for human beings), irreversibility (lost species cannot be replaced), life support (some ecological assets serve life-support functions) and loss aversion (people are highly averse to environmental losses). The 'strong sustainability' position has much to commend it, but institutional responses have varied.

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information could be useful? 5 Of the different figures and tables presented in this chapter, which two or three would you find most helpful when trying to understand a project and its impacts? 6 Section 4.8.1 suggests that quite complex impact identification methods have been devised in the past but not used much in practice. What might be the reason for this?

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theory and practice . P. Wathern (ed), 62–83. London: Unwin Hyman. SOME QUESTIONS The following questions are intended to help the reader focus on the key issues of this chapter. 1 Magnitude of impact is not always synonymous with significance of impact. Provide examples from your experience to illustrate this point. 2 Assess the case for using expert judgement as a key prediction method in EIA. 3 Similarly, examine the case for using causal network analysis in EIA. 4 How can uncertainty in the prediction of impacts be handled in EIA? Consider the merits of different approaches. 5 Consider the value of the qualitative multi-criteria decision analysis (MCDA) exemplified in Figure 5.9, for various stakeholder groups, for assessing the trade-offs between different types of impacts. 6 Examine the application of the mitigation hierarchy to the impacts of a major project with which you are familiar. What constraints might there be in following the logical steps in that hierarchy in practice? 7 The enhancement of beneficial impacts has had a low profile in EIA until recently. Why do you think this has been so, and why is the situation now changing? 8 Consider what might be included in a Community Benefits Agreement for (a) a major wind farm development in a remote rural location; and (b) the redevelopment of a major football (soccer) stadium in a heavily populated urban area.

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