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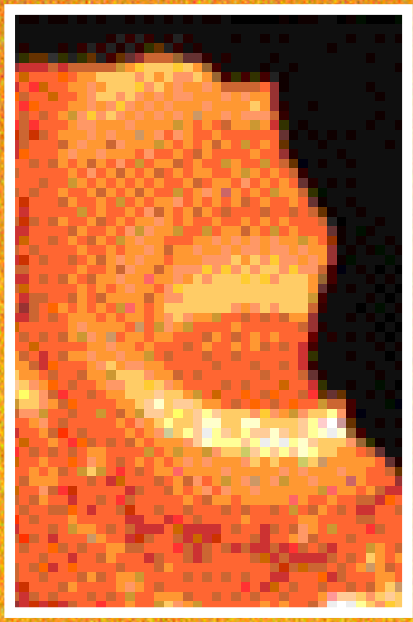

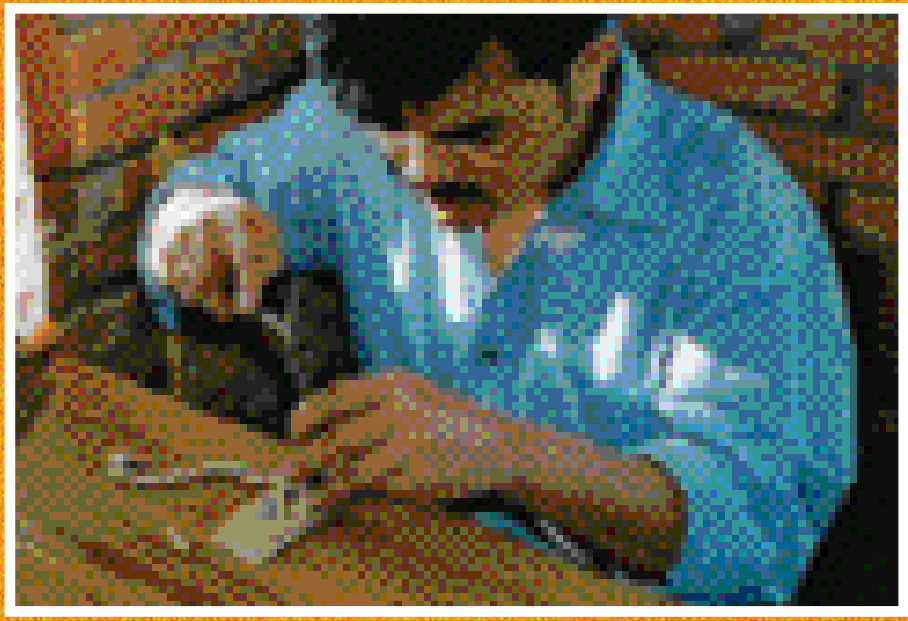

A review of key issues

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Natural Resources and Ethical Trade

TOWARDS AN ETHICAL JEWELLERY BUSINESS

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Towards an Ethical Jewellery Business

Page

Executive Summary ..... **i**

Introduction **1**

1. Artisanal and Small-Scale Mining and Processing of Gems **3**

Background to gemstones and gem mining 3
Key issues and challenges 7
Environmental and social impacts of gem mining 13
Existing and Recommended Policies, Programmes and Practices 24
Summary of Key Points 30

2. Large-scale Mining and Processing of Silver **31**

Background to silver mining 31
Key issues and challenges 34
Environmental and social impacts of silver mining 42
Key Existing Programmes and Good Practices 52
Summary of Key Points 57

3. Processing Gems and Metals and Jewellery Manufacture **58**

Introduction and Background 58
The diamond supply chain 59
Sri Lanka Gem and Jewellery Industry 64
The Gem and Jewellery industry in Thailand 68
The gem and jewellery industry in India 70
Summary and Key issues 71

4. Jewellery retail and the consumer market **74**

Introduction 74
Consumer markets for precious metal and gemstone jewellery 74
The Jewellery Industry in the UK 76
Ethical practices in the Jewellery industry 79
Summary 91

5. Cross-Sector & Cross-Supply Chain Standards and Initiatives **92**

6. Mapping of issues and approach to further research **96**

Summary of literature and gap analysis 96
Developing a phase two research approach 97
Developing phase two research objectives 99
Potential collaborating partners for phase 2 100

References **101**

ANNEX 1 Specific environmental impacts of silver recovery **118**

ANNEX 2 People consulted **127**

ANNEX 3: World Diamond Council Warranty System **128**

List of Boxes

Page

Box 1.1 Examples of gemstones 3
Box 1.2 Summary of gemstone production in Thailand, Tanzania, Madagascar and Brazil 5
Box 1.3 Small-scale versus large-scale gemstone mining – the example of Sri Lanka 13
Box 1.4 Environmental Impacts of Illegal Mining – the situation in Sri Lanka 17
Box 1.5 Environmental and Socio-health impacts of emerald production in Zambia .. 23
Box 1.6 Cooperation between ASM and large-scale operators 29
Box 2.1 Cannington Silver Mine, Queensland, Australia 32
Box 3.1 Definitions of conflict diamonds 61
Box 4.1 Industry Awareness Raising on Conflict Diamonds and KPCS 86
Box 4.2 Silverchili Fair Trade Principles 90

List of Figures

Figure 1. World mine production of silver by source (2001) 32

List of Tables

Table 1.1 Numbers of ASM workers for some gem / non-primary diamond producing countries 6
Table 1.2 Summary of the major causes of environmental impacts 18
Table 1.3 Summary of potential environmental impacts 19
Table 1.4 Summary of the social impacts of gem ASM and their potential causes. 20
Table 1.5 Existing Policies, Programmes and Practices 24
Table 1.6 Recommended Policies, Programmes and Practices 26
Table 2.1 Top 20 silver producing companies, 2001 (Silver Institute, 2002) 31
Table 2.2 World's leading primary silver producers, 2001 (Silver Institute, 2002)..... 33
Table 2.3 Major silver producing countries, 2001 (Silver Institute, 2002) 34
Table 2.4 Overview of environmental impacts and their potential causes 44
Table 2.5 Examples of mitigating or aggravating site or regional specific factors 45
Table 2.6 Potential water contaminants and their sources 47
Table 2.7 Summary of the social impacts of large-scale mining and potential causes . 49
Table 2.8 Key Existing Programmes and Good Practices 52
Table 3.1 Margins and value added in diamonds 60
Table 3.2 Sri Lanka gem & jewellery exports 64
Table 3.3 Licenses awarded by NGJA 65
Table 3.4 Employment in the Sri Lanka gem and jewellery industry 65
Table 3.5 Exports of Gems sold through the NGJA 66
Table 3.6 India's exports of Gems and Jewellery, 1996-7 to 2001-2 72
Table 3.7 Destination of Indian Exports of Gems and Jewellery 73
Table 4.1 Demand for gold Jewellery (tonnes) 1997-2002 75
Table 4.2 UK Retail Sales of Jewellery 77
Table 4.3 Retail shares of the jewellery and watch market, by type of outlet, 1999 and 2001 78
Table 5.1 Summary Overview of Key Global Standards or Initiatives 93
Table 6 Existing documentary knowledge levels in the jewellery supply chain 97

List of Acronyms

ADTI	The Acid Drainage Technology Initiative:
AFGEM	African Gem Mining Company
AGA	Applied Geology Associates Limited
AMIRA	Australian Mineral Industries Research Association
ASM	Artisanal and small-scale mining
ATO	Alternative trading organisation
BAFTS	British Association of Fair Trade Shops
BJA	British Jewellers Association
CASM	Communities and Small-Scale Mining Initiative (World Bank/DFID)
CIBJO	Confederation International de la Bijouterie, Joaillerie, Orfevrierie des Diamantes, Perles et Pierres (International Confederation of Jewellery, Silverware, Diamonds and Stones)
CSO	Central Selling Organisation
DFID	Department for International Development (UK)
DRC	Democratic Republic of the Congo
DSE	Deutsche Stiftung für internationale Entwicklung (German Foundation for International Development)
DTC	Diamond Trading Company
DTI	Department for Trade and Industry (UK)
E/SIA	Environmental and social impact assessment
EPA	Environmental Protection Agency
ETI	Ethical Trading Initiative.
FLO	Fair trade labelling organisation International
GDO	Government Diamond Office
GJEPC	Gem and Jewellery Export Promotion Council
GMI	The Global Mining Initiative
GRI	The Global Reporting Initiative (United Nations Environment Programme)
GVC	Global value chain
HSBC	Hong Kong Shanghai Bank
HSE	Health and safety and environment
ICEM	International Federation of Chemical, Energy, Mine and General Workers' Union
ICMM	The International Council on Mining and Metals
IFAT	International Federation for Alternative Trade.
ILO	International Labour Organisation
INAP	The International Network for Acid Prevention
IPEC	The International Programme on Elimination of Child Labour.
ITDG	Intermediate Technology Development Group
JDA	Jewellery Distributors Association
JOA	Jewelers of America
JVC	Jewelers Vigilance Committee
KIASIA	Kenan Institute Asia
KPCS	Kimberley Process Certification Scheme
LDCs	Less developed countries
LEAT	Lawyers' Environmental Action Team (Tanzania)
LVMH	Louis Vuitton Moet Hennessy
MAC	The Mining Association of Canada

MEND	Mine Environment Neutral Drainage Program
MiMi	Mitigation of Environmental Impact of Mining Waste
MMSD	Mining Metals and Sustainable Development
NAG	National Association of Goldsmiths
NGJA	National Gem and Jewellery Authority
NGOs	Non governmental organisations
PAC	Partnership Africa Canada.
PNG	Papua New Guinea.
Rs.	Rupees
SAWIMA	South African Women in Mining Association
SGC	State Gem Corporation
SGJE	Sri Lanka Gem and Jewellery Exchange
SL	Sustainable Livelihoods
STD	Sexually transmitted disease.
TGJTA	Thai Gem and Jewellery Traders Association
TJA	Thai Jewellery Association
TMDA	Tanzania Mineral Dealers Association
UN/DTCD	United Nations Department of Technical Cooperation for Development
UNGA	United Nations General Assembly
USDI	United States Department of the Interior
WBCSD	World Business Council for Sustainable Development
WDC	World Diamond Council
WTO	World Trade Organisation.

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Executive Summary

This report presents the results of phase 1 of research which is intended to identify the main social, environmental and ethical issues in the jewellery sector and to assist industry bodies in identifying how to integrate ethical considerations into their activities. The phase one report is based on an extensive review of literature related to ethical issues in the jewellery sector, covering ethical issues throughout the jewellery supply chain, from extraction of jewellery materials by mining processes, through to the retail of finished jewellery. In addition to highlighting established existing knowledge and literature in this field, our report highlights gaps in the literature and understanding that will influence the form and focus of more applied research to be proposed for phase two of the project.

Small-scale gemstone mining

The gemstone industry is comprised of distinct diamond and non-diamond sub-sectors, with the vast majority of non-diamond gemstones mined in low-cost, widely dispersed artisanal and small-scale mines (ASM) in remote regions of developing countries. Countries with major non-diamond gemstones and gemstone production include Brazil, India, Tanzania, Mali, Sri Lanka, Madagascar, Thailand and Mali.

There are a rapidly increasing number of people seeking ASM livelihoods in rural areas of the developing world, which is putting pressure on available environmental and social resources, compounded by increasing gender inequality and child labour as well as poor health and safety and environmental practices in ASM. These issues are made all the more challenging by limited public budgets for investing or regulating the ASM sector.

Usually, the environmental impacts of ASM mining are negative and are physical, atmospheric, biological and ecological in nature. Many of these are preventable and are affected by location, timing, mining methods and technology. The social impacts of ASM are both positive and negative and tend to relate to health, livelihoods, economics and culture. The most significant negative social impacts are indirect and a consequence of environmental impacts and a lack of investment. The most significant positive impact is employment.

Most gemstone producing countries have punitive environmental and social ASM policies that are rarely enforced. The focus of policy has therefore shifted from legislation, to programmes that assist ASM as part of a general poverty alleviation strategy. The latter do not aim to exclude ASM but to minimise its negative, and enhance its positive, impacts. Many successful programmes involve institutional partnership support for the ASM sector.

Large-scale silver mining

The vast majority of silver is traded as a homogenous product, based on large-scale mining in the hands of a relatively small number of producers. In different ways, these factors make it both difficult and easy to trace the source of silver and to implement ethical considerations along the supply-chain. Over three quarters of all silver output is driven by, and produced as a primary product of, lead / zinc, gold, and copper mine extraction and processing.

Key environmental issues in silver mining relate to waste management, groundwater contamination, acid rock drainage, and pollution from accessory metals. Positively, metal mining is a significant source of employment in remote and underdeveloped regions and provides crucial tax revenue for many developing countries. However, community voluntary and involuntary mine resettlement and dependency present major ethical dilemmas and have forced companies to adopt innovative management approaches.

The environmental impacts of large-scale silver mining are generally negative and influenced by the nature of mining processes and regulation. The social impacts are more generic, both positive and negative, and affect local health, culture, economics and livelihoods. The most serious social impacts are often the least tangibly connected to mining and often include cumulative impacts like mental illness and alcoholism.

Social and environmental metal mining policies exist in all mining economies, but larger companies tend to adhere to more stringent international standards because of the need to secure a 'license to operate'. Stakeholder pressures have given rise to a wide range of mining initiatives and codes that are being increasingly translated into innovative and responsible practices at the operational level in a new risk conscious investment climate.

Processing gems and metals and jewellery manufacture

There is little literature on the sourcing and trading of gems and silver in the jewellery industry. The exception is some key studies in the gold and diamond supply chain. The industry is extremely complex, involving many thousands of businesses involved at different stages. In general, processing and manufacturing tends to be fragmented, although there are many small companies bound together in intricate trading relationships. Despite changes precipitated by globalisation, most notably the movement of labour-intensive activities to regions with low labour costs, the industry is characterised by geographic clusters of firms. Within these clusters, firms are inter-linked with each other through trading relations and layers of sub-contracting, often bound together through ethnic and family ties, or links built up over long periods of trading. There are close links between the various processing centres, held together by traders, in often-impenetrable networks bound by secrecy.

Despite the complexity of the industry, we can identify three basic stages in jewellery production: (i) cutting and polishing of gems, (ii) finishing of metals and (iii) setting and final preparation of the jewellery. However, there are frequently overlaps between manufacture and wholesale. The report explores these stages in the chain through case studies of the gem and jewellery industries in India, Sri Lanka and Thailand.

Some of the more business-focused literature on the sector highlights the important role that is played by industry associations, from the perspective of economic development and co-ordination of export promotion in the industry. In such a fragmented industry, a representative organisation is likely to be pivotal to the introduction of ethical initiatives in relation to gathering support and ensuring that local understanding is embedded in the initiative.

Jewellery retail and the consumer market

At the distribution end, small and unbranded companies predominate, with only a handful of branded retailers. In the middle, are thousands of small traders whose trading relations are very private and largely invisible to the public, tending to hide information on procurement and sales destinations from their competitors.

As with many smaller businesses along the supply chain, their management remains disconnected from wider public interests and consumer attitudes. It is therefore difficult to make them responsive to ethical supply base and production issues. Indeed, any such strategy will have to sensitise and raise their awareness in language they understand.

To date, action on ethical issues in the industry is dominated by the Kimberley Process Certification Scheme, but the scope of ethical action is being widened by Jewelers of America, which has projects focusing on labour issues in gem and jewellery processing and environmental issues in mining. Some individual jewellery businesses, often characterised as fair trade, have focused more on the development of partnerships with suppliers.

Cross-sector and supply chain standards and initiatives

There are an increasing number of standards and initiatives that are relevant to, though not particular to, the jewellery sector as a whole. They feature significantly in key policy debates on the future of the world economy and address a wide range of general ethical issues, including labour conditions, health and safety, environment and human rights.

Fundamentally, the focus of these new initiatives and standards is no longer about what is produced, but on the way it is produced and delivered. The spread of standards along the entire supply chain of different sectors has caused considerable debate, since many regard them as non-tariff barriers. However, the momentum originates from those who see compliance as essential to environmental and social development.

Multilateral institutions such as the ILO and the UN have developed and influenced many of these initiatives and standards, increasingly in collaboration with civil society, public and private actors. Among these standards and initiatives it is possible to broadly distinguish between those adopting a process approach and those adopting a performance approach.

Mapping issues and further research

The vast majority of established literature is based on stages of production along the supply chain rather than links between these stages, or the supply chain as a whole. Within these areas, differential levels of data availability exist. There is abundant material on ethical issues in both the small and large-scale mining industry, but relatively little material on the processing and manufacture of gems and jewellery.

In particular, there is very little literature on traders and trade links between actors in the gem processing and jewellery industry or on how jewellery components are sourced. To date, the jewellery sector, as a whole, appears not to have attracted the attention of either ethical or business supply chain researchers. Even where data exists, it has

contained little or no analysis of the linkages between stages of production in the supply chain.

Given these results, a research approach that analyses the nodes in the supply chain and how they are linked together would appear to have the greatest potential to further ethical understanding in the jewellery sector. It is suggested that this should focus on (a) trading networks between the key activities of mining, processing, jewellery manufacture and (b) social and environmental issues in gem and jewellery manufacturing and processing. Since the gem processing and jewellery manufacturing industries are fragmented and trading relations are typically secretive, this mapping and analysis is likely to be a difficult process. Nevertheless, a 'supply chain' approach is the best strategy to fill gaps in our understanding of the chain and inform development of an ethical strategy for the supply chain.

Strategic options for development and application of ethical business practices in the jewellery industry are; - to develop internal management systems within a vertically integrated company; - to develop partnerships with suppliers based on good working conditions, fair trading relations and a long-term mutual commitment; - or to develop and implement a code of practice for use by suppliers. The success of these respective strategies will be greatly influenced by a retailer's position in the market, by resources and extent of influence of the business, and by the scale of industry support.

Phase two of the research will be oriented toward a strategy to create information for enabling the jewellery sector, as a whole, to adopt more ethical practices. Key issues include identification of 'drivers' within the value chain and of key actors for the promotion of ethical standards, together with an exploration of the nature of ethical standards that would be viable in the industry, including content, scope and approach.

Introduction

This phase one research report is based on an extensive review of literature related to ethical issues in the jewellery sector. In addition to highlighting established existing knowledge and literature about ethical issues in the jewellery sector, our phase one research aims to highlight gaps in the literature and understanding that will influence the form and focus of more applied research to be proposed in phase two of the project.

The review draws on a wide variety of sources, including, but not restricted to, company reports, journal articles, trade publications and interviews with key representatives and decision-makers in the jewellery sector. The scope of the review has not been restricted to any one stage of the jewellery supply chain, but encompasses extraction, processing, manufacture, distribution and retail. However, because of the differential quality and quantity of material in these areas, there is variation in the coverage given to these areas.

In compiling and writing this report we have largely maintained a functional separation of this sourced material. In particular, material on mining (extraction) has been kept separate from processing, distribution and retail. This is partly for ease of analysis and presentation. However, it is also because the vast majority of established literature is based on stages of production along the supply chain rather than links between these stages, or on the jewellery supply chain as a whole. Indeed, this is a key finding of the report.

Chapter one of the report documents literature related to ethical issues in artisanal and small-scale mining (ASM). As many of the issues for ASM as a sector relate to those for the ASM of gemstones, this chapter is particularly, though not exclusively, focused on gemstone mining. The first section of the chapter provides context to subsequent discussions on ethical issues of gemstone mining, with background on gemstones and ASM. The second and third sections respectively discuss key ethical issues and challenges associated with gemstones mining and summarise key social and environmental impacts associated with them. The fourth section summarises documented policies, programmes, and practices designed to address these issues and impacts.

Chapter two of the report documents literature related to ethical issues in large-scale mining. As many of the issues for large-scale mining as a sector relate to those for large-scale mining of silver, this chapter is particularly, though not exclusively, focused on silver mining. The first section of the chapter provides context to subsequent discussions on ethical issues of silver mining, with background on silver and large-scale mining. The second and third sections respectively discuss key ethical issues and challenges associated with silver mining and summarise key social and environmental impacts associated with them. The fourth section summarises documented policies, programmes, and practices designed to address these issues and impacts.

Chapter three discusses the steps involved in processing the raw materials for jewellery: on gem processing (cutting and polishing), the production of jewellery and the trading involved between these steps. In the main, we adopt a country case study approach, partly due to the paucity of material, but also for ease of presentation of the key issues. Following a brief discussion of the structure of these industries and the general nature of

trading relations, the chapter discusses the diamond supply chain followed by discussions of the gemstone processing and jewellery industries in Sri Lanka, Thailand and India.

Chapter four focuses on distribution and the retail market for jewellery with particular reference to the UK market. Key industry actors are identified and the nature of supply chain relationships presented. The second part of the chapter explores ethical business practice and ethical standards adopted in the industry, concentrating on the Kimberley Process and conflict diamonds, but also with reference to the Tucson Protocol for tanzanite and the approaches adopted by single companies, including the fair trade approach.

Chapter five briefly introduces and documents the raft of emerging cross-sector and cross-supply chain standards and initiatives that are not particular to the jewellery supply chain, or to production stages within it, but nevertheless have significant actual and potential influence on the jewellery sector as a whole. The first section of this chapter provides some background to these standards and initiatives, while the second section summarises detail about the individual standards and initiatives.

The first section of the final chapter analyses the review of literature, highlighting areas where there are specific gaps in the literature and in understanding related to ethics and the jewellery supply chain. This forms the basis for defining a broad approach to phase two research, outlined in the second section and for developing a research strategy, covered in the third section of the chapter.

1. Artisanal and Small-Scale Mining and Processing of Gems

Background to gemstones and gem mining

Gemstones have no single, precise definition that is generally accepted. According to Webster's New International Dictionary (1961, p. 1,042), a gem is "*Any jewel, whether stone, pearl or the like, having value and beauty that are intrinsic and not derived from its setting; a precious or, sometimes, a semiprecious stone cut and polished for ornament. A semiprecious stone of value because it is carved or engraved, as a cameo or intaglio*." Additionally, the dictionary states that a gemstone is "*Any mineral or petrified material which can, when cut and polished, be used in jewelry*" (Webster's New International Dictionary, 1961, p. 1,043). For this report, the terms "gem" and "gemstone" are taken to be interchangeable. Examples of some of the more common gemstones are shown in Box 1.1. These may occur naturally as individual crystals or in massive form (i.e. no distinguishable crystals). In general, gemstones occurring as crystals are more valuable on a weight-per-weight basis than gemstones occurring in massive form.

Box 1.1. Examples of gemstones

Agate	Diopside (chrome)	Peridot
Alexandrite	Emerald	Quartz
Allanite	Garnet	Rhodochrosite
Amazonite	Goshenite (colorless beryl)	Rhodolite
Amethyst	Grossularite (garnet)	Rhodonite
Ametrine	Heliodor (yellow beryl)	Rose quartz
Ammolite	Hiddenite	Rubellite (red tourmaline)
Andalusite	Idocrase	Ruby (red corundum)
Apatite	Indicolite (blue tourmaline)	Sapphire (corundum)
Aquamarine	Iolite	Serpentine
Aventurine	Jade (jadeite & nephrite)	Sodalite
Azurite	Jasper	Spectrolite
Benitoite	Kunzite	Sphalerite
Benitoite	Labradorite	Sphene
Beryl	Lapis lazuli	Spinel
Bixbite	Malachite	Sunstone
Cairngorm	Moldavite	Tanzanite
Calcite	Moonstone	Topaz
Cats-eye	Morganite (pink beryl)	Tourmaline
Charoite	Onyx	Tsavorite (garnet)
Chrysolite	Opal	Turquoise
Chrysoprase	Padparadschah (orange corundum)	Variscite
Citrine	Pectolite	Zircon
Diamond		

Gemstones form in many different environments, almost all of which are below the Earth's surface. Some gemstones are brought to the surface through mining, while others are moved upward in the host rock by natural processes such as faulting, folding, large-scale uplift and volcanism. In the latter case, after rock is brought to the surface, gemstones may be released from the rock by weathering, which washes gemstones into surface waters (e.g. streams, rivers, lakes etc.) where they are concentrated by river / ocean processes. Gemstones deposited in this way are therefore often those minerals that are resistant to chemical weathering. They are commonly concentrated in streambeds and beach sands in what are known as alluvial deposits. Gemstones often have quite a high specific gravity (density) compared to other minerals, so that they are easily trapped in depressions in streambeds. This causes them to become concentrated and makes it easier to mine them.

The majority of non-diamond gemstone mines are small, low-cost and widely dispersed in remote regions of developing nations. Foreign countries with major non-diamond gemstone are Afghanistan (aquamarine, beryl, emerald, kunzite, lapis lazuli, ruby, and tourmaline); Australia (beryl, opal, and sapphire); Brazil (agate, amethyst, beryl, ruby, sapphire, topaz, and tourmaline); Burma (beryl, jade, ruby, sapphire, and topaz); Colombia (beryl, emerald, and sapphire); Kenya (beryl, garnet, and sapphire); Madagascar (beryl, rose quartz, sapphire, and tourmaline); Mexico (agate, opal, and topaz); Sri Lanka (beryl, ruby, sapphire, and topaz); Tanzania (garnet, ruby, sapphire, tanzanite, and tourmaline); and Zambia (amethyst and beryl) (US Geological survey, 2001) (see Box 1.2 for examples of producing countries and relevant gemstones).

The gemstone industry worldwide is comprised of two distinct sectors: (a) diamond mining and marketing and (b) the production and sale of other gemstones. Globally, 40% of diamonds by value are from De Beers mines, based mainly in southern Africa and 34% of diamonds by value come from Russia, Australia and Canada. This production is from large-scale mining, highly mechanised, and controlled by four mining giants: De Beers Consolidated Mines Ltd, Alrosa Ltd, Rio Tinto and BHP Billiton (Global Witness 2002: 34). About 24% of remaining diamond production comes from ten countries of West and Central Africa and the remaining 1.6% from Latin America and Asia, predominantly extracted by small-scale miners using much more simple technology (Goreux 2001).

While a few major mining companies control most diamond supplies, other gemstones are primarily produced by artisanal and small-scale mines (ASM) in relatively small, low-cost operations with few dominant producers. Overall, ASM is currently estimated to account for the vast proportion of gemstone mining (90-100%) in the majority of gem producing countries and for 80-100% of diamond mining in countries that are not primary producers; for example, Ghana, where ASM accounts for 82% of total diamond production (Hilson 2001). An analysis of gemstone mining and production as a whole, can in many respects be viewed as an analysis of ASM, therefore, it is this that forms the focus of this section.

Box 1.2. Summary of gemstone production in Thailand, Tanzania, Madagascar and Brazil

Thailand – has resources of 17 different gemstones from amethyst and aquamarine to ruby and sapphire. In terms of quantity and value, ruby and sapphire, however, are more important than the other gemstones. Historically, ruby and sapphire have been produced mainly from the Provinces of Chanthaburi, Kanchanaburi, and Trat, with important ruby and sapphire deposits in the Khao Phloi Waen, Khao Wua, Khao Saming, Phulu Yang, and Pong Nam Ron areas of Chanthaburi Province; in the Bo Phloi area of Kanchanaburi Province; in the Bo Rai area of Trat Province; and in the Nam Yuen area of Ubon Ratchathani Province. In 2001, gemstones (mostly blue sapphires) were produced only from Kanchanaburi Province (Department of Mineral Resources, 2002, p. 22). About 98% of raw gemstone output was sold to domestic jewellery manufacturers, which make Thailand one of the world's leading gem and jewellery exporters.

Tanzania – more than 200 different occurrences of gem minerals are known in Tanzania, particularly in the Mozambique Orogenic Belt. In recent years, alexandrite has been produced at Tunduru; aquamarine, at Mhuva; cat's eye, at Lake Manyara and Tunduru; emerald, at Lake Manyara; garnet, at Magagoni and Tunduru; opal, at Kasulu; olivine, at Gelai; ruby, at Mahenge, Matombo, Morogoro, and Tunduru; sapphire, at Songea, Tunduru, and the Umba Valley; scapolite, at Dodoma; spinel, at Tunduru; topaz, at Magagoni; tourmaline, at Mhuva and Same; and zircon, at Tunduru. Block C of the Merlani mining area is estimated to contain two-thirds of the world's known deposits of tanzanite. Blocks B and D of the same area are being mined by artisanal miners.

Madagascar – famous for its many deposits of gemstones, such as emerald at Mananjary, ruby at Andilamena and Vatomandry, sapphire at Ilakaka and Manditsara, and tourmaline at Anjanabonoina. Amethyst, aquamarine, citrine, garnet, and sphene and such ornamental stones as agate, aragonite, jasper, labradorite, and rose quartz are also produced. Artisanal miners produce most of Madagascar's gemstones. In 2001, the production of amethyst, aquamarine, garnet, sphene, and tourmaline fell because miners stopped work on these gemstones and moved to the newly discovered ruby deposits at Andilamena and Vatomandry. In the first half of 2001, between 30,000 and 40,000 miners were estimated to be working at Andilamena. Although the rubies produced at the Vatomandry deposit were higher quality than those at the Andilamena deposit, in February 2001 the Government closed it to mining to prevent environmental, health, and smuggling problems. Enforcement of the closure has been partially successful.

Brazil – one of the world's largest gemstones producer and exporter. Many different varieties of gemstones include, in order of importance, emerald, aquamarine, diamond, amethyst, citrine, chrysoberyl, opal, topaz, agate, and tourmaline, which are found throughout the country. Brazil is the world's only source of such quality gemstones as imperial topaz and Paraíba tourmaline. In 2000, mining of gemstones continued to be dominated by garimpeiros (artisanal miners) (82% of the total produced). However Garimpeiros' production continued in decline, because of fewer garimpeiros and increased environmental restrictions. At the end of 2000, the Government closed some high-content gem places in indigenous reserves to exploration.

Source: U.S. Geological Survey Minerals Yearbook, 2000 & 2001 (and references therein)

Table 1.1 shows the significant gem and non-primary diamond producing countries and estimates of the total and proportion production of gems by ASM in these countries, along with the numbers of workers involved.

Table 1.1: Numbers of ASM workers for some gem / non-primary diamond producing countries*

Gemstones	Total ASM Workers (thousands)	Proportion of Gem ASM Workers
India	600	Not Known (NK)
Malawi	40	NK
Mali	200	NK
Mozambique	60	NK
Sri Lanka	170	72%
Tanzania	550	54%
Zambia	30	35%
Diamonds		
Brazil	400	11%
Ghana	200	30%
South Africa	10	NK

**Derived from MMSD global and country ASM reports*

When analysing the ASM sector, it is important to understand the terms *artisanal* and *small-scale*. *Artisanal* is generally taken to refer to non-organised small-scale mining. It may involve only individuals or families and is mainly manual. A recent definition of artisanal mining describes it as '.. *the most primitive type of informal, small-scale mining, characterised by individuals or groups of individuals exploiting deposits with the simplest equipment*' (Barry 1996). The use of the term *small-scale* implies some degree of organisation and management. Small-scale mining is usually seen to be more extensive and mechanised than artisanal mining. Mine output is most commonly used to distinguish small-scale from medium or large-scale mining, often by reference to operations with an annual production of less than 100,000 tonnes of ore (Noetstaller 1987, Davidson 1998, DSE and UNDTCD 1991). However, there is no universal definition of what small-scale mining encompasses. In addition to output, the definition may be based on capital invested (e.g. Argentina and Thailand), the number of workers (e.g. Chile, Pakistan and USA) or even the type of technology applied. Country-based examples include:

- **Brazil** – individual or collective extractive work, using rudimentary tools, manual devices or simple portable equipment. Such items are used for immediate exploitation of minerals that can be worked, independent of previous exploration work, according to criteria set by the National Department of Mineral Production. Separate definition for "*garimpagem*" (artisanal mining) as individual work performed by panners with rudimentary forms of mining, using manual or portable equipment and applied only to alluvial, colluvial and eluvial deposits.
- **Burkina Faso** – artisanal exploitation refers to activities conducted on ore bodies or deposits by natural or legal persons using traditional techniques or with minimal mechanisation.

- **Chile** – mining operations by a person who works a mine property or process plant by himself, with or without family support, up to a maximum of five salaried workers, or by a legal society with no more than six partners. It also includes operations by mining co-operatives with partners who are actual artisanal miners.
- **Ethiopia** – small-scale mining is designated as such by the government where the annual run-of-mine ore does not exceed a certain limit, which differs from one mineral product to another and depends on the nature of mineral occurrence. Artisanal mining refers to non-mechanised mining operations of gold, platinum, precious minerals, metals, salt, clay and other similar minerals, by essentially manual methods carried out by Ethiopian individuals or groups.
- **Ghana** – small-scale mining refers to operations of individual Ghanaians or organised groups of Ghanaians (four to eight individuals), or co-operatives of ten or more individuals, which are entirely financed by Ghanaian resources at a certain limit and carried out on a full-time basis using simple equipment and tools.
- **Guinea** – small-scale mining is the exploitation of precious minerals such as gold, diamonds and other gemstones found in primary or alluvial deposits, outcrops or sub-outcrops.
- **Mexico** – small-scale mines are those with annual production values of less than US$3 million, provided that their daily production capacity is less than 200 tonnes per day for metal mines, and less than 300 tonnes per day for non-metal mines.
- **Philippines** – small-scale mining refers to activities that rely heavily on manual labour using simple implements and methods, and do not use explosives or heavy mining equipment. Also defined as a single unit of operation with annual production less than 50,000 tonnes of run-of-mine ore and where working is artisanal, heavily reliant on manual labour, with no sophisticated mining equipment or major investment in infrastructures and processing plants.
- **Surinam** – small-scale mining is the exploitation of mineral deposits that due to their mode of occurrence and their size, can be mined economically by simple means and techniques.

Key issues and challenges

Both small-scale and artisanal miners may have the legal title to the land that they work recognised by the state and by others. However, it is estimated that in many countries, over 50% of small-scale miners operate illegally (ILO 1999b). Artisanal miners are even more likely to work land they have traditionally inhabited, but without any recognition of land rights from the state, or they may be working the land informally and regarded as illegal squatters by local and state authorities. Nevertheless, both artisanal and small-scale miners tend to share many characteristics, including the fact that they lack capital and have poor access to markets, exploit marginal or small deposits, are labour intensive with low rates of recovery, and have poor health and safety and environmental practices (MMSD 2002).

The public sector orientation of mining policies has also supported a dramatic increase in uncontrolled informal mining in many African countries. Unregistered artisans who export most of their production illegally, currently perform a significant level of precious metals and gemstone mining in Africa. African governments do not receive

any tax revenues and the environmental costs of illegal artisanal mining can be considerable (World Bank, 1992b).

The most frequently cited social and environmental challenges of ASM and the ASM of gems in the literature, relate to combating the informal, and therefore predominantly unregulated, nature of the sector (Harrison *et al.* 2003). This serves as a serious impediment to improving the sector's contribution to sustainable development, because it operates outside government supervision and therefore lacks formal support and can avoid following environmental standards or health and safety regulations (MMSD 2002).

In addition to environmental and social concerns, there are fiscal and political incentives for governments to encourage the formalisation of this sector. The loss of revenue and foreign exchange earnings, through informal gem and diamond smuggling and trading in particular, is estimated to be very significant. For example, in Madagascar, virtually all the country's $400 million worth of gemstones are illegally exported (Hentschel et al. 2001). In addition, according to Oxfam (2001), the political instability resulting from the financing of rebel activity through, for example, *blood diamonds* in Angola and Jade in Afghanistan, is causing concern among the authorities of diamond and gem producing countries.

The lack of formal protection increases the ability of intermediaries and traders to exploit ASM miners, and therefore also gives miners a strong incentive to legalise. Mining communities in the ASM sector typically have to sell rough gems and diamonds at relatively low prices, while those working further along the chain, including traders and intermediaries and manufacturers, make over 1000% increases, much of it profit, before it reaches the consumer. By establishing their own processing industries, a more equitable share of the profits can be retained by ASM communities themselves. Although they can do this informally, their chances of securing capital and government services both to increase and expand existing mining activities and to develop their own vertical linkages, are much higher in the formal sector (MMSD 2002).

There are many difficulties with trying to formalise and regulate ASM, however. Most significantly, less developed countries simply lack the resources to support ASM activities or to enforce applicable legislation where it exists. These difficulties are often compounded by widespread corruption among enforcement officials (Macfarlane and Mitchell 2003). Moreover, Baker (1990) and Tarras-Wahlberg (1999) found that even the best-funded systems for social and environmental control encounter problems in monitoring given the typically remote, disparate and large number of individuals, companies and co-operatives that typically operate in the ASM districts of less developed countries.

Attempts to legalise ASM have also encountered problems rooted in a general scepticism on the part of the miners of the benefits of becoming legal and having to pay taxes and royalties, finance environmental impact assessments, and undertake other environmental prerequisites (DSE and UNDTCD 1991). Indeed, for miners, there are few obvious benefits to registering their activities and obtaining legal status when the process is generally bureaucratic and costly and while their risks of prosecution are low (EPA Jamaica 2002). In an extensive study of gem ASM in Sri Lanka, Henney (2000:25) captures these issues:

> *Sri Lanka has established institutions and introduced legislation to cover gem mining. To this end it has a working and recognised legislative framework and regulatory system. However in practice this system is largely ineffectual and treated as a nuisance by the gem mining industry which largely operates in the informal private sector. Enforcement is piecemeal and ad hoc leading to widespread disregard of the legislation, no matter how well intended. Even when licenses are applied for, the procedure is lengthy, expensive and slow.*

While the relationship between government and ASM presents a general sustainability challenge, the relationship between ASM and large-scale mining companies particularly threatens and challenges the sustainability of ASM livelihoods. This relationship is often characterised by tension and mistrust. It stems from a natural competition to exploit the same finite resource, but is compounded by a tendency for government to favour large operators when granting legal entitlement, and for large operators to use ASM miners as 'unpaid geologists', exploring wherever there is ASM activity (MMSD 2002).

Many larger companies have tried to keep ASM at bay by engaging high-level security. There are many examples from the general ASM literature of such strategies leading to serious conflict. A particularly notable case concerns an allegation by a Tanzanian NGO that in 1996 the Kahama Mining Corporation forcibly displaced and evicted up to 400,000 ASM miners and their families from its proposed mine site (LEAT 2003). Such examples have usually involved the gold mining industry where the involvement of both large and small-scale operators is high. The proportionately lower-level involvement of large-scale gem operators has meant lower levels of conflict. Nevertheless, anecdotal evidence suggests that conflicts between large and small-scale scale gem operators certainly occur, and sometimes with fatal consequences (Macfarlane 1999a).

There is a need to decide at the outset whether the objective of legislation is to control and/or confine small-scale mining, limiting its impact particularly with respect to large mining operations, or whether it is to enable small-scale mining to flourish as a viable entrepreneurial economic activity. Restrictive provisions, both technical and administrative (such as short-term permits, and lack of security of tenure), constrain development, trapping small-scale mining in a sub-optimal state, or they encourage illegal mining. Engulfing small-scale mining with many regulations and short-term, non-negotiable permits makes expansion difficult, credit virtually impossible to obtain, and consideration of environmental impact most unlikely. There is a danger that, in working to attract large, foreign mining investment, governments framing small-scale mining legislation will focus on how best to confine small-scale mining rather than encourage it. But the inevitable institutionalisation of illegal mining and tension between large and small operations will also have a severe long-term negative impact if large mining companies are deterred from investing because of the extent of illegal small-scale mining. Governments must therefore find the right balance. Hence the need for wide consultation of all concerned when framing small-scale mining legislation.

Much small-scale mining legislation is intended primarily to help nationals of the country concerned get into mining and restricts this activity to them. In some cases, land for small-scale mining by local citizens is reserved. Problems arise when local

credit is not available to finance continuing operations or an expansion. When illegal investment from overseas entrepreneurs is sought, it can put the local operator at the risk of being closed down; moreover, because the investment is illegal, its terms are likely to be less favourable for the miner than if local credit had been legally obtained. Once again, the need to consider all the implications of developing the small-scale mining sector must be taken into account when legislation is being drafted.

In principle, all mining operations should comply with tax and environmental regulations. Many problems are likely to arise, however, if the informal sector is forced to comply with the law. This sector is highly mobile and dispersed. Moreover, it has a combativeness that makes it difficult for the government to enforce the law – particularly as much of the activity occurs in a 'frontier' environment. In such a case, it is preferable to think of policies to discourage the growth of the sector.

Job losses in other economic sectors, in addition to natural calamities such as drought, mean a growing number of people in developing countries are taking up ASM (Henney 2000, Gunson and Yue Jian 2001). In 21 of 35 developing countries ASM had increased in last 5 years, decreased in 2, and remained constant in 12. In South Africa, for example, the number of ASM workers is expected to triple over the next ten years (Drechsler 2001). Due to the informal nature of much ASM it is hard to establish the total number of ASM workers, although research by the ILO (1999b) suggests that globally, ASM involves 13 million people directly and affects the livelihoods of a further 80-100 million.

Most ASM miners are rural and poor. In countries such as Ghana, Mali, India and Sri Lanka they often come from communities that have a long tradition of small-scale mining. In Sri Lanka, for example, gem mining has a history of at least 2000 years and continues to the present day (Gunawardene & Rupasinghe1986). However, gem miners are not necessarily involved in this activity full-time. Because artisanal mining is largely poverty-driven, it has grown as an economic activity, which commonly complements more traditional forms of rural subsistence earnings. Amarasinghe's (1999) study of ASM in Sri Lanka showed that gem mining predominantly involved local people carrying out gem mining as part of the community's cycle of activities, often when the agricultural workload is at a minimum and when the paddy fields are not producing crops.

In Africa, it is estimated that some 20 million people directly or indirectly depend on some form of ASM for their subsistence. The MMSD Southern Africa report (2002) acknowledges that ASM is '*typically practised in the poorest and most remote rural areas by a largely itinerant, poorly educated populace, men, and women with few employment alternatives'*. This observation is also relevant to other Sub-Saharan African regions, where the vast majority of artisanal miners are involved in gold, diamond and gemstone mining, usually also in the poorest and the most remote rural areas.

Although women account for around 40% of the workforce of ASM of gems in African countries like Madagascar and Mali, ASM tends to be a predominantly male activity. In Sri Lanka, for example, ASM of gems is exclusively male (Amaramasinghe 1999) and on average, the proportion of females in the ASM of gems is estimated to be approximately 20%. Women tend to be engaged in most aspects of mining except

usually the handling of mechanised equipment and are indirectly involved through ancillary activities such as the supply of food, drink, tools and equipment, as well as gemstone trading (ILO 1999b).

In 1999, the ILO adopted Convention 182 on the 'Worst Forms of Child Labour', which was ratified by 113 countries by 2001. Nevertheless, many children continue to work in ASM, with estimates of the number involved varying between 2% and 30% of the workforce, depending on country and mineral. In Papua New Guinea, for example, children provide up 25% of the small-scale mining workforce. Children tend to work in ASM as a means to supplement the basic family income. This is regarded to be particularly problematic because of the special vulnerability of children to physical and chemical hazards and because of the potential sacrifices they may be making to their education and their future prospects, so reinforcing the cycle of poverty (ILO 2001, MMSD 2002).

ASM gem mining extraction tends to be terrain specific, but practices are distinguishable. Perhaps the simplest types of working are river dredgings, which are developed around the exploitation of present-day river gravel and earth exposed during down cutting and erosion by the river. In its simplest form the dredging operation involves raking up river gravel or earth into a shallow pile and letting the river wash away the fines. The resulting coarse fraction is picked over by workers to extract the gem minerals. In some instances, particularly where the river is too deep to permit 'traditional' dredging methods, bottom sediment is dredged into weighted baskets pulled across the riverbed on ropes and then processed on the riverbank (Harrison et al. 2003).

A combination of lack of resources, lack of, or non-application of, safety regulations, lack of awareness, illiteracy, lack of training, inadequate equipment and remote location all point to the likelihood of there being more accidents in the many small-scale mining operations than in larger, more formal, more public mines. On the other hand, the nature of small-scale mining (low level of mechanisation, low intensity of operation) means that some of the risks can be lower than in large, formal mines. Nevertheless, many fatal and disabling accidents do occur in small-scale mines and it is widely acknowledged that they are under-reported or not reported at all as, even in licensed operations, there is frequently no form of compensation or social security provision for injury or death. Moreover, illegal operations have no wish to draw attention to themselves as an accident will merely lead to unwanted administrative, legal and operational problems.

Protective equipment, in both mineral extraction and beneficiation, is generally non-existent. Miners suffer cuts from rocks due to lack of safety boots and gloves; some work under hanging roofs of open stopes without any safety helmets. Pneumatic drills are commonly used without any water for dust suppression, and operators do not wear ear protection. Crushing and grinding are all dry processes and the risks are greater because much of the mineral is contained in ore with a high silica content. The frequency of mining health hazards, however, are often as high as the health hazards in adjoining mining communities, which are commonly overcrowded, and where accommodation consists of poorly ventilated makeshift huts that lack adequate sanitation facilities.

Problems of insufficient clean water and inadequate sanitation, and the sickness and diseases that follow, underpin much of what is unsatisfactory about small-scale mining, particularly in areas that have seen sudden influxes of people in search of a living through mining. Where small-scale miners live at the mine site, or where processing is carried out in nearby communities, health and sanitation conditions are generally poor. Where crushing and grinding are carried out within living quarters, large amounts of respirable dust are released into the compound. Water for domestic use is often from the same source as that for mineral processing. Where domestic water is collected from open wells there are often serious health implications. Only boreholes and protected wells can be considered to provide safe water. The use of river water for domestic purposes is of particular concern, since these rivers are also used for panning and bathing. Most people use pit latrines or the open bush – with obvious health consequences. Malaria, cholera, tuberculosis, bilharzia and enteric infections are common. Even long-term miners are unwilling or unable to afford the construction of hygienic sanitation facilities. Transient miners have little incentive to do so. Associated problems of lack of education facilities (generally associated with high levels of child labour), crime, prostitution and sexually transmitted diseases quickly follow.

The poverty trap in which many artisanal miners find themselves means that technologies and techniques used are inefficient and relatively unproductive. The marginalised nature of this sector means that small-scale miners have little access either to institutions that provide training, or to technology appropriate to mining, let alone the credit to capitalise on such access. A second problem is in the prospecting for mineral deposits. Artisanal miners tend to lack the skills and tools to prospect for suitable deposits. Governments, mining companies and multilateral development agencies have a clear comparative advantage over small mining communities in prospecting activities.

Box 1.3. Small-scale versus large-scale gemstone mining – the example of Sri Lanka

Sri Lanka is famous for its great variety and abundance of extremely high quality gemstones. Significant gem fields had been known since historic times. These fields are largely confined to alluvial soils deposited by the larger rivers draining the central, southern and western parts of the country.

The methods used have dominated for nearly 2,500 years and are simple, small-scale and worked on a system of cooperative sharing of the profits from the activity. In pitting, shafts are made to reach where deeper levels of gem-bearing gravel exist. Tunnels, which rarely exceed 10-12 feet, are made to collect the gravel. Walls are supported with timber species that resist rot and fern is used for panelling to protect against water seepage into the tunnel. Pits are generally confined to marshy terrain and paddy lands. Gems are also mined from riverbed material by a method of dredging. Generally 8-10 people work each pit. Flooding is the main hazard in pit mining and the workers of the present day generally use water pumps to dewater.

There is a tendency to operate suction pumps for extraction of riverbed gravel for gems. There may be little or control of the operation, and riverbank stability can be impacted by gravel removal undermining the banks. Compared to the small-scale traditional type of operation, where potential impacts may be relatively minor and easily rectified, larger-scale operations such as those using suction pumps may cause more serious and long-term impacts. Therefore, the Sri Lankan government considers that a fully mechanised operation would require a mandatory Environmental Impact Assessment prior to licensing.

Allocation of large tracts of land or river to large-scale operations would be likely to deprive small-scale miners of opportunities to improve their livelihoods and quality of life (e.g. through poverty alleviation). Equally, the loss of access to gemstone fields may lead to increases in unemployment and social unrest.

In Sri Lanka there are 30,000-40,000 gem pits in operation that provide additional income to nearly 150,000 people per mining season, with most of the labour undertaken by those in low-income groups. Given that local gem miners have been practising the same method for more than 2000 years and no major adverse impacts have been reported, it seems that small-scale rather than large-scale operations are the most appropriate in environmental terms. Equally, supplies from small-scale gem mining are balanced with demands. If large-scale gem mining were conducted, problems of over-supply and decreasing market price could arise.

Environmental and social impacts of gem mining

This section draws on literature relating to the general environmental and social issues and impacts associated with ASM and related processing activities, and – where available – specific information relating to the production of gemstones. It is designed to provide the reader with an indicative rather than exhaustive overview of the diverse range and types of social and environmental impacts generated by ASM gem projects.

The existing literature on the impacts of ASM and ASM of gems can be divided into two fairly distinct parts. The first, are those that are technical-scientific in nature and

describe the chemical and biological character of the impacts caused by ASM and processing operations (e.g. Grosser et al. 1994; Malm et al. 1995; Meech et al. 1998). The second, are those that are concerned with the socio-political and economic conditions and impacts of ASM and processing activities and the identification of policy measures to manage these (e.g. DSE and UNDTCD 1991, Warhurst 1994, Barry 1996). A Wardell Armstrong programme recently (2003) commissioned by DfID aims to take a more holistic approach, which considers both environmental and socio-political / economic conditions and impacts and how these factors may collectively inform efforts to improve ASM management. However, to date such research has been limited (Tarras-Wahlberg 2002).

In relation to environmental impacts of ASM and gemstone ASM in particular, the situation in each country varies according to the type of gemstones being exploited, the social and natural environment of the area and cultural and organisational aspects of the mining operation itself. The main determining factors, however, will be the stage and the nature of the method of mining and processing. These factors are summarised below. However, while it is possible to generalise regarding mining and processing methods (and by inference the associated environmental and social impacts), it is important to recognise that local or site-specific factors may significantly influence actual impacts.

Exploration
Exploration and development techniques are generally primitive, labour intensive and essentially non-technical, using local traditions, methodologies and practices that have not changed significantly for generations. Small-scale miners typically do very little systematic exploration before and during mining operations. Instead, prospecting and exploration activities usually include pitting and in some cases trenching, to assess the geological setting for possible pockets containing gemstones. These excavations are often made indiscriminately and in the absence of mechanisation, are rarely more than 5 metres deep. Indeed, the pits are most often positioned dug on a whim of the mine or land owner. Logging of the nature of successful and unsuccessful pits is rarely carried out, often resulting in wasteful reworking of depleted or barren ground. In many countries, finding good workable gem deposits may become increasingly difficult, due to over-working and lack of proper exploration strategies at local, regional and national levels.

Underground extraction
In general, underground gemstone mining and processing includes breaking the rock using low-energy explosives, followed by material sorting by hand after cobbing. Underground mining takes the form of pits, often excavated by illegal miners either on virgin gemstone field or fields already developed. Excavated materials may be processed on-site, or – where extraction is being undertaken illegally – removed to a more discrete location where the valuable gemstones can be recovered.

As many of the pits are dug in relatively fine-grained soils and silts, the extraction of the gems from the matrix involves considerable washing. However once the gems are washed out of the soil, not only is a lot of fine grained material washed into rivers and streams, but much of the material which should used for back filling the pit is lost. As a result many of the large pits are left unfilled, partially collapsed and /or flooded.

When it is a legal, licensed operation, then the pits are usually back-filled once mining has finished, particularly when pitting is taking place on agricultural land. This also allows recovery of some of the wooded support material once mining has ceased. However, this rarely happens if the mining is unlicensed.

Surface extraction
In the early stages, surface operations tend to be labour-intensive using simple tools mainly steel picks, hammers, shovels and wheelbarrows to break the ground, handle and dispose of waste. The excavated material may be disposed of indiscriminately around pits and trenches. As operations progress, a variety of other equipment (e.g. self-owned or hired bulldozers, excavators and dump trucks) may be used to expand and deepen the existing exploration pits and trenches, or to excavate completely new pits, often without any mine plans. The waste that is dumped in mined-out space may be re-worked several times or scavenged by illegal miners.

In some areas, where there is a thick residual soil or overburden, or where the ground is relatively dry and well drained, larger open pits may be dug. These are often several tens of meters wide and often up to 4 meters deep with steps cut in the walls for access down to the gem gravel. The walls of these pits are totally unsupported and hence are prone to collapse in adverse conditions.

River Dredging
The dredging of river and stream beds for gems has several significant negative impacts on the environment, the most immediate of which is the destruction of the natural watercourse by bank erosion and over deepening of the riverbed (often resulting in concomitant shallowing downstream). This has knock on effects including enhancing the effects of any flooding by breaking down the river bank and removing vegetation, in particular mature trees, which help reduce the extent of flooding and maintain the integrity of the river bank. The erosion of the riverbank also makes it hazardous for the local community to access, what is in many instances, the main supply of water for domestic activities. The constant agitation of the riverbed results in the release of fine-grained particulate material into the river which can significantly reduce the quality and potability of the water several miles downstream from the mining site. The contamination of the water can also impact on the ecology of the flora and fauna of the river system by reducing the amount of light reaching the bed of the river and by obscuring and coating surfaces in the river system. This can affect fisheries by degrading the water and impacting on the invertebrate food supply for fish and other fauna using the river. River dredging is often carried out illegally and if not closely controlled has a significant negative impact on the environment and workforce safety.

There are environmental impacts from all three types of operations. Pits and other mining excavations are often left in a dangerous and visually unattractive state due to the lack of economic or other imperative to reclaim and rehabilitate workings. Equally, surface workings can cause disturbance of fauna and flora, deforestation, drying or rerouting of surface waters due to excessive evaporation from cleared lands and use of water during mining and processing. Siltation of streams occurs as a result of erosion from waste dump areas. A failure to carry out even basic remediation such as back filling pits or draining flooded workings is recognised as poor practice with significant negative environmental impacts. These include sedimentation of clay and silt on to agricultural land and into watercourses from the spoil heaps associated with gem pits.

The raising of the beds of river channels by enhanced sedimentation, reduces their capacity to carry flood water and silting up of minor drainage and irrigation channels reduces their effectiveness.

Gemstone processing
Due to the unique geological nature of gemstone deposits, whereby mineralisation is localised in small pockets, processing of mined gemstones differs from one gem to another. Generally, however, the processing of gemstones that occur as distinct crystals, consists of hand sorting with the aid of the visual characteristics of the gems (fluorescence, shine, colour). Typically, no equipment is used in this process. Normally, such pieces recovered during hand-sorting in the pits and trenches still need additional cleaning using hammers, chisels, pliers, pincers or grinding wheel. Typical processing also involves chipping (the breaking of crystals along natural fractures into smaller more marketable sized pieces) and sorting (involving grading according to appropriate criteria).

Gemstone mining does not generally involve the use of toxic or hazardous chemicals. However, it may give rise to the release of pollutants that are naturally present in the rock and overburden (e.g. from minerals that are present in the mineralised zone hosting the gemstones). Pollution by petrochemical products such as grease, oil, diesel and petrol may also occur in areas using mechanised equipment.

Other gemstones may occur in massive form rather than as individual crystals (i.e. where the gemstone itself forms the majority of the extracted material). Processing of these may be less extensive, as the extracted material is sold directly as raw output. In general, gemstones that occur in massive forms (e.g. turquoise, azurite, jade) are less valuable on a weight-per-weight basis than those occurring in crystal form (e.g. emeralds, rubies, sapphires).

Box 1.4. Environmental Impacts of Illegal Mining – the situation in Sri Lanka

This activity is the major source of environmental damage associated with gem mining in Sri Lanka and has been formally recognised as an issue requiring some remedial action to prevent further long term damage (Dissanayake & Rupasinghe 1995, cited in Henney1999; Rupashinhe & Cooray, 1993). These authors estimate that there are up to 15,000 illegal gem mining operations in Sri Lanka and recognised five major impacts resulting from such gem mining:

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Most illegal mining occurs on government land, often in rubber or tea plantations and in active watercourses (rivers and streams). Impacts are predominantly due to poor mining practice and the lack of remedial action once mining has ceased. This mainly arises because the miners have no vested interest in carrying out remedial work on what is generally not their property. Instead their efforts are directed towards exploiting new gem occurrences.

Within some communities, in particular those where gem mining is a supplement to agriculture, the remediation of gem mining sites is carried out routinely as this is essential to restore the rice field to full productivity. This however, often requires the use of additional fertiliser due to the mixing of topsoil with infertile illam during back filling of old gem pits.

The major problem with illegal gem pits is that they are totally unregulated. Not only do they ignore the government's legislation as promulgated by the National Gem and Jewellery Corporation but they also ignore the accepted norms and conventions of gem mining as recognised by the local community. However some illegal mining is carried by local communities on their own doorstep, usually when an accidental discovery of high value gems occurs. Examples of the consequences of illegal activity which have been reported and observed include the collapse of a metalled public road due to undermining by illegal gem pits, collapse of the walls of a rural hospital again undermined by illegal tunnelling in pursuit of gemstones and the pollution and disruption of water supplies by flooding from unfilled or poorly maintained pits. It is important to note, however, that legal, licensed gem pitting also has many of the same problems, in particular failure to remove spoil heaps, and although environmental protection legislation exists in Sri Lanka, damage still occurs.

Table 1.2. Summary of the major causes of environmental impacts

CAUSES	High Significance	Medium Significance	Low Significance	Comments
Extraction-related				
Underground extraction		✓		May result in slip or collapses at the surface and changes to water surface movements
Removal of soil (no replacement)	✓			Soil is effectively 'mined', increasing erosion potential
Removal of overburden	✓			Management critical to restoration; disposal may cause further water-related impacts and windborne dispersion
Extraction of gravel - in-stream	✓			Major source of direct impacts
Extraction of sand and gravel – floodplain	✓			Major source of direct impacts
Waste disposal	✓			Some sites may have limited waste production
Suspended solids	✓			Cause of multiple impacts
Dissolved solids			✓	Gem mining may not be primary cause (e.g. agriculture and other industries may be sources of chemicals)
Processing-related				
Process machinery operation			✓	Limited activities for most sites
Discharge – suspended solids	✓			Management of sedimentation ponds is critical
Discharge – dissolved solids			✓	Low input relative to other potential sources
Discharge – diesel etc		✓		Limited mobile plant, but normally in or near to surface waters
Discharge – other chemicals			✓	Extremely limited use on-site
Discharge – metals		✓		Some metals may be released by leaching from host mineralisation
Discharge – sewage/municipal waste		✓		May be low input relative to other potential sources

Table 1.3. Summary of potential environmental impacts

IMPACTS	High Significance	Medium Significance	Low Significance	Comments
Water				
Physical contamination	✓			Endemic
Chemical contamination (e.g. metals)		✓		Metalliferous mineralisation is a possible source
Loss/reduction of water resources	✓			Quantity and quality of water may be impacted
Flooding		✓		Technical solutions at individual sites will have limited impact on controlling the risk of flooding
Land				
Loss of amenity land	✓			Can be very significant in areas
Loss of housing land	✓			Can be very significant in areas
Loss of agricultural land	✓			Can be very significant in areas
Contamination			✓	Unlikely – wastes are largely inert, and few chemicals (except diesel and lubricants) are widely used
Waste disposal		✓		Land sterilisation is possible concern, but main waste disposal is to river or on-site at flood plain operations
Air				
Dust	✓			Extensive dust migration may occur – may be difficult to distinguish between mining-related and environmental dust
Fumes			✓	Only significant for mechanised operations. Limited to operation and immediate environment
Physical				
Operational noise			✓	Limited to operation and immediate environment
River incision			✓	Occasional significant direct and indirect impacts
Bank erosion	✓			Significant direct social impacts
Bed erosion	✓			Biodiversity impacts
Shifting of river course		✓		Technical solutions may be implemented
Biodiversity				
Loss of diversity in fauna and flora		✓		May have food chain effects

Table 1.4. Summary of the social impacts of gem ASM and their potential causes.

Social Impact	Potential Cause	References
Socio-Health		
STD including AIDS	Because of lack of alternative employment options for women and the comparatively high disposable income of ASM miners, prostitution can become rife. This predominates in migrant ASM worker areas and in ASM operations in South America and Africa where there is a specific ASM 'frontier culture'. The problem of illegitimate children from sexual liaisons between migrant large / small-scale workers and local women, rarely in receipt of subsequent financial or paternal support, is also noted.	Canterbury 1997 Hyndman 1992
Stress, Hyper-tension, Depression.	The vibration and noise effects of ASM blasting, drilling, pumping and transportation can have an adverse impact on the mental and physical health, interfering with human activities such as sleep, speech and hearing. It can also induce stress-related illnesses such as hypertension and depression.	Tsidzi and Adofo 1995 ILO 1999b
Eye and Respiratory Infections	The generation of excessive atmospheric particulates or dust from activities such as soil stripping and dumping, blasting, open pit drilling, ripping and haulage all act as particulate generators. Atmospheric dust caused by mining activities like these raise the incidence of respiratory infections such as tuberculosis and silicosis in ASM miners and communities.	ILO 1999b
Digestion and Gastric Disorders	Gastric disorders are particularly pronounced where ASM miners have temporarily converged in camps around new or remote deposits with poor sanitary conditions and no public health facilities. The release of mine oxides following extensive surface ASM can generate acid rain. In some areas this has drastically reduced fish stocks due to the acids leaching aluminium to surface waters. Trees and crops may also be affected due to the leaching of key nutrients, impacting on human health and nutrition.	Franklin 1998 MMSD 2002
Skin Damage	A study of ASM in Sri Lanka revealed that miners pointed out skin damage on hands, legs and feet resulting from the effects of constant long-term immersion in water during mining and particularly washing of the gravel. This risk factor and condition was common to the majority of gem operations in Sri Lanka.	Henney 1999
Liver Failure, Delirium, Skin Infection.	Chemical solutions are rarely used in ASM gem mining but are not unknown. These are often left untreated either in pools or allowed to seep into the groundwater, posing a particular health risk that can be fatal or result in disorders like conjunctivitis, delirium, dermatitis, blindness, and liver failure. Women and children are particularly vulnerable to these chemicals.	Parker 1996 MMSD 2002
Poisonous Bites	A risk factor not restricted to ASM gem workers but heightened due to the nature of the gem mining operation (digging and working in remote tropical areas) is that of snakebite. This was noted in Sri Lanka, which has the highest incidence of death from snakebites per head of population in the world, mainly amongst the rural population, especially farmers although no detailed figures are available about the relative incidence between population groups.	Henney 1999
Malaria, Cholera and Bilharzia.	Alterations by ASM to the hydrological environment in tropical regions can significantly increase the risk of malaria. The excavations associated with ASM mining create stagnant waters that are in direct proximity to mine workers and the community and are breeding grounds for malaria carrying mosquitoes. This has resulted in the reappearance of malaria in areas considered disease free and where the local population has little or no immunity to illness. This has a major impact on local health resources.	MMSD 2002 Henney 1999

Table 1.4 (cont)

Social Impact	Potential Cause	References
Reduced Wellbeing	Land is usually denuded through ASM in the form of waste dumps and excavations, and stripped of its vegetation. Unless these effects are mitigated through back filling, re-vegetation and landscaping, the aesthetic appeal of an area can be dramatically reduced with a commensurate psychological effect on the surrounding community.	Wilson 1982 MMSD 2002
Accidents and Injury	ASM excavations can be deep and hard to identify. They have been known to be the cause of many, even fatal, injuries through internal collapse or fall. Other ASM accidents and injuries result from over exertion, inadequate workspace, inadequate and obsolete equipment, rock fall, subsidence, poor training, and poor pit ventilation (heat, humidity, lack of oxygen). In gem ASM the ventilation issue can be compounded by high concentrations of methane and hydrogen sulphide present in the bottom of some deeper pits due to the high organic content of the gem bearing sediments. These injuries are symptomatic of ASM's unregulated or unenforceable nature and fatality and injury rates are difficult to ascertain due to the clandestine nature of much ASM.	Henney 1999 ILO 1999b
Physical Exhaustion	ASM workers are rarely given fixed working hours and are often contracted as share workers. As a result, they do not work specific hours as a daily waged earner. They work at a stretch from morning till evening. At times they have to work through the night in order to complete certain work. Apart from having to work continuously, they do not enjoy leave facilities. Once a mine is excavated, work often has to be continued non-stop. Frequently, a worker absent due to illness or any other reason has to send a replacement on his behalf to be employed on a daily paid basis.	Macfarlane 1999a Henney 1999
Drowning	As well as collapse of workings there is also a prevalent risk from flooding in deeper ASM shafts in tropical regions. Although most have some kind of pumping system, these can easily be overwhelmed by sudden influxes of water, by encountering water-bearing strata during mining and by 'flash flooding'. Evidence suggest that fatalities are rare but do occur, particularly when high rainfall alters the engineering properties of the poorly consolidated soils and gravel.	Henney 1999
Assault, Liver and Nervous disorder, Depression.	Drug and alcohol abuse has been identified as one of the most serious impacts of large and small-scale mining, with its associated effects on the incidence of injury, violent assault, depression and liver disorder. These impacts can be compounded by fear among ASM operators / workers that they will be subject to official interventions affecting their livelihoods.	Fox et al. 1977 Kesteven 1984
Socio-Cultural		
Loss of Social Control and Order.	Large and diverse migratory ASM population increases can lead to housing shortages, inflationary pressures, income disparities and consolidation of cash economy. The contrast between newcomers and the entrenched population can also destroy existing informal mechanisms of social control.	Freudenburg 1980 Wright 1997 Macfarlane 1999a
Increased levels of Social Malaise.	Some, particularly migratory, ASM gem projects are associated with the 'boom town scenario', characterised by increased crime and violence, drug and alcohol abuse, stress, community instability, drunkenness and suicide. A marked rise in crime, and particularly violent crime, is specifically linked to informal migrant ASM's due to their lack of regulation, 'frontier culture', transitory and non-cohesive nature, and pursuit / defence of land.	MMSD 2002 Avotri 1997 Seyditz et al. 1999 Amnesty Internat. 1993
Conflict	In isolated areas ASM can cause tensions and divisions between migrant workers and the indigenous community. In politically unstable countries there are difficulties with securing ASM diamond operations that have made them vulnerable to attack / exploitation by rebels and illegal operators. Hence the problem of *conflict diamonds*.	Mckee & Bell 1986 Neil et al 1992 Goreux 2001

Table 1.4 (cont)

Social Impact	Potential Cause	References
Urbanisation & Dissolution of Existing Norms.	In remote rural areas, the influx of migrant ASM workers, can lead to the dissolution of existing traditional cultures and the emulation of urban cultures among indigenous community members, resulting in rapid rural-urban migration with its attendant social impacts.	Renner 1997 Macfarlane 1999a
Socio-Economic		
Loss of Productive Land	Large-scale operators often hail ASM operators as the best (and cheapest) indicator of larger exploitable reserves. Indeed, it is said that 'where artisans go the giants soon follow'. The attraction of large-scale operators by artisanal activity can result in larger impacts, not least, resettlement and relocation of rural communities on less agriculturally productive lands.	Kamara 1997:25) Bhandari 1994 Macfarlane 1999a
Increased National Revenue	Formal and regulated ASM can provide a small source of national revenue through fixed taxation. Mine developments can also potentially benefit the local economy through the payment of local taxes and government royalties if they are fed back through localised mineral re-investment funds.	Waelde 1992. Harrison et al 2003
Material and Consumption Gains.	Given the risky nature of many, especially illegal, ASM activities, gem miners can be comparatively well remunerated or can supplement income from alternate employment. This can extend the range and quantity of items they can purchase and consume. However, research found that male ASM workers often squandered disposable income on gambling, prostitution and alcohol. This is shown to be less likely when female partners or community members are also in ASM and can exert cultural or financial control.	O'Faircheallaigh 1991 Macfarlane 1999a UNDP 1999:17 ILO 1999b
Enhanced Social Development	Some formal and regulated gem ASMs have made small financial or 'in kind' contributions to local communities by facilitating and supporting the development of community infrastructure, housing, training, and health.	Harrison et al 2003
Socio-Livelihood		
Loss of Sustainable Livelihoods	Local people attracted by real or imagined ASM opportunities can abandon less lucrative but more sustainable livelihoods. When the rush is over and mining activities have subsided, local people may conclude that they have sacrificed their traditional livelihoods for few lasting benefits.	MMSD 2002 Labonne 1997
Direct Employment	Where ASM has taken place over an extended period of time in the same location, the livelihood contribution of such employment tends to be limited to supplementing existing incomes. However, in new and remote areas it can provide temporary or full-time work and is often the only real source of income and only means of survival. Overall, because ASM involves low start-up costs it represents an important and accessible source of employment at national level in several countries and a very important level of rural employment in many countries of the world.	Redwood 1997 Labonne 1997 Labonne and Gilman 1999
Indirect and Secondary Employment.	The direct employment potential of ASM decreases with more exhausted or inaccessible deposits and higher mechanisation, but its indirect employment potential, through increased demand for local goods and services remains high. In addition, workers in ASM often make much more than in alternative activities in the area—Recent surveys in Indonesia and the Philippines suggest that these can be as much as 200% to 500% higher. These higher incomes can lead to higher savings and investments (which in ASM are typically made locally) and therefore employment in other activities.	Labonne 1997 Labonne and Gilman 1999

Box 1.5. Environmental and Socio-health impacts of emerald production in Zambia

Emeralds are mined in the Ndola rural restricted area situated about 70 km south of Kalulushi town in Copperbelt Province. The mineralised area covers approximately 1,200 km^2, within which there are several gemstone license holders. Mining activities date back to 1931 when the Miku emerald deposit was discovered. Unlicensed mining activities continued until 1984 when licensed operations started following the declaration of the area as protected. To date these operations have become so extensive that mining excavations and huge waste dumps have become the most common sights. However, illegal mining activities continue, making it even more difficult to control. In general terms, mining practices in rural Ndola are conducted at three different levels:

- enterprise. These operations are normally spontaneous activities without legal title to the property worked. Artisanal mining in Ndola is predominantly by illegal miners.
- non-mechanised or semi-mechanised mining operations run by society members or entrepreneurs with the use of hired labour and with a basic management structure. Most mines in rural Ndola are of this description. These mines lack financial resources and appropriate management and technical skills. The operations are done haphazardly such that overburden is dumped in the direction of the ongoing excavation. In a bid to minimise costs, benching is usually inadequate resulting in high dangerous walls.
- undertake reasonable geological investigations and mine planning prior to beginning.

Underground mining takes the form of narrow tunnels following the mineralised vein. These excavations are a safety hazard, being poorly lit and ventilated, and lacking ground support. Considerable groundwater is met in the course of these excavations, which is pumped from the pit using petrol-driven or electric pumps to the surrounding area without treatment. In Ndola, the water passes through the surrounding ground including waste dumps before draining into Kafubu River. Huge amounts of waste are generated especially where heavy-duty earth-moving equipment is used. This waste is normally dumped randomly around the pit without proper planning resulting in huge pollution problems.

Existing and Recommended Policies, Programmes and Practices

Table 1.5: Existing Policies, Programmes and Practices

Type	Key Strategies, Regulations, Initiatives, and Best Practices	Reference
Policy	Sri Lanka typifies many LDCs with gem ASM, possessing legislation relating to the limiting of environmental damage caused by gem mining (this is included within the 1971 Act, and reinforced by the Mines and Minerals Act of 1992 (Sections 61,1.3)). It is also typical in charging the Geological Survey and Mines Bureau (or an equivalent body such as an EPA) with responsibility for monitoring and enforcing such legislation. However, as noted earlier, the enforcement of ASM legislati7on is difficult and largely ineffectual.	Dissanayak and Rupasinghe 1995 cit. Henney 2000
Policy	Given the difficulty of enforcing regulation in this area, the strategic focus of discussions has moved from legal and technical policy measures to policies that assist ASM as part of an overall strategy of poverty alleviation and sustainable livelihoods. This has been the focus of all recent ASM policy meetings such as the ILO's major 1999 Tripartite Meeting on Social and Labour Issues in ASM, as well as meetings of the Mines and Ministers of Americas and of the Union Economique Monetaire Ouest-Africane.	Hentschel et al 2001
Policy	Not all government ASM policies have been aimed at trying to legalise ASM or mitigate its negative social and environmental impacts; some have also been about enhancing its positive impact. In this way, the Sri Lankan government has banned the use of heavy, large-scale mechanised mining methods in gem mining, both to prevent the rapid depletion of an irreplaceable resource and to maintain an alternative source of revenue for much of the rural population that is otherwise dependent on agriculture.	Henney 2000
Programme	Fair Trade e.V., a German NGO, has established links with many ethically approved producers – including co-operatives producing platinum, gold and jewellery in South Africa and Bolivia, and gem producers in Madagascar and Tanzania. Producers benefit from these marketing channels by getting higher and more stable prices and higher turnover by cutting out intermediaries and opening up new markets. The qualifying criteria for producers to have access to these marketing channels, are to work within a democratic framework and to be committed to high environmental and labour standards.	Hentschel et al 2001 MMSD 2002
Programme	A number of NGOs such as ITDG in Zimbabwe and the Mineral and Energy Policy Centre in South Africa are actively undertaking research, training and support work for ASM miners. Germany finances programmes in Colombia, Ghana and Zimbabwe and the UK is looking at a model scheme of assistance for ASM. DfID & Wardell Armstrong are conducting research on ASM issues.	Drechsler 2001
Programme	The Southern African Development Community (SAWIMA) and the Tanzanian Women Miners' Association collectively lobby to support women in mining. They also train women in health and safety and environmentally sound mining methods, establish revolving loan funds, facilitate product marketing, rent mining equipment as well as a lapidary and jewellery, and assist with rehabilitation.	SAWIMA 2000 World Bank 2001
Programme	The UN Department for Economic and Social Affairs has taken a sustainable livelihood approach for artisanal mining communities. This is currently being implemented as a pilot initiative in Ethiopia, Ghana, Guinea, and Mali. The main policy recommendations are (1) Poverty eradication in all sectors. (2) ASM to serve as catalyst and anchor to stimulate complementary and alternative ventures. (3) Strengthening the capacity and capability of ASM communities.	Hentschel et al 2001 MMSD 2002

Table 1.5: Existing Policies, Programmes and Practices (cont.)

Type	Key Strategies, Regulations, Initiatives, and Best Practices	Reference
Programme	The ILO, through its International Programme on the Elimination of Child Labour (IPEC), has been working with the Peruvian NGO *Cooperaccion* since 1998 in one artisanal mining community to help the local population to identify alternatives to child mining. The ILO is also working in the Philippines to provide education and vocational training to children withdrawn from mining.	OIT/IPEC and AECI 2000
Programme	At the multilateral level, a group of donors launched the Communities and Small-Scale Mining (CASM) initiative. CASM is housed in the World Bank and hosted by DfID. Its mission is to enhance the developmental impact of ASM work at ground and policy level in ways that increase the sustainability of communities affected by or involved in ASM in developing countries. It intends to achieve this by promoting communication and co-ordination between miners, communities, government and other stakeholders.	CASM 2001
Practice	When the inhabitants of Sadiola in western Mali, a traditional ASM mining area, were resettled by AngloGold, the company undertook consultation with traditional groups and local NGOs before introducing the Sadiola Mining Co-operative. This provided technical assistance to the miners, including geological studies and training and testing in mining equipment. On the community side it led to the creation of a community development fund and support for a school, learning centre and a health centre. The project also supported small enterprise including bakers, wood and metalwork shops and jewellers. The number of people engaged in ASM has since declined because of the better commercial opportunities, highlighting the link between ASM and poverty.	Keita 2001 MMSD 2002
Practice	When in 1992, Placer Dome, purchased the Las Cristinas concession in Venezuela, they inherited a legacy of the involuntary resettlement of 5000 ASM miners and their families. With no alternatives provided, the miners continued to work the concession illegally. Placer averted confrontation with the miners by allocating them their own suitable concession. Partly to fulfil their legal requirements and to build local commercial capacity, Placer also assisted the artisans to create an association with full legal status. The association has agreed norms on HSE, substance abuse and discipline, and provides leadership, labour and knowledge to the artisans. In addition, Placer continues to provide technical support and training to the association in mining methods and business management. The achievement of legal status has enabled the association to apply for other concessions and expand operations.	McPhail and Davy 1998 Davidson 1998

Table 1.6: Recommended Policies, Programmes and Practices

Type	Key Strategies, Regulations, Initiatives, and Best Practices	Reference
Policy	Development of policies to bring about the formalisation of artisanal mining in order to transform it from being an illegal, unregulated activity using inappropriate technologies, to one that is legal, regulated and supported through access to appropriate technologies, government services and capital. The formalisation process involves detailed examination of a series of key areas, namely regulation, technology, financial, social and environment. Possible strategies for the transformation process may include: (i) Transforming and upgrading artisanal mining into organised and modernised mining. (ii) Facilitating the availability of appropriate and affordable mining tools, equipment and consumables and encouraging the manufacture and supply of the same. (iii) Promoting partnership between local small-scale miners and large-scale investors to facilitate technology transfer and optimise mineral resources exploitation. (iv) Providing supportive extension services in mining, mineral processing and marketing. (v) Streamlining and simplifying the licensing of artisanal miners and mineral dealers. (vi) Preparing, disseminating and enforcing a code of conduct in mining and mineral processing. (vii) Promoting marketing arrangements, which are responsive to the requirements of the artisanal and small-scale mining sub-sector.	MMSD 2002
Policy	It is argued that formal and bigger operations are more likely to have the knowledge, awareness, and financial resources necessary to carry out mining in environmentally responsible ways. Furthermore, their compliance with environmental legislation, by virtue of their size, may be more readily controlled and assured. Therefore, says Tarras-Walberg (1999:177): 'A clear policy needs to be defined which promotes the reorganisation of small-scale operators into formal companies or co-operatives operating bigger and more mechanised operations based on proven reserves'. But, he acknowledges that, such reorganisation may be detrimental to employment opportunities and could lead to the concentration of power and financial resources in a few hands. Hence, policy measures need to include consideration of how to create alternative job opportunities with the funds generated by mining, and to ensure that the benefits created by a consolidated industry are equitably shared.	Tarras-Walberg 1999
Policy	Artisanal and small-scale mining require relatively small capital outlays but financial institutions have been slow to respond to the financial needs of this sub-sector. At the same time, local financial institutions are not fully aware of the economic potential of the sub-sector and are therefore reluctant to formulate financial schemes to support its development. The government can emphasise the improvement of small-scale miners' access to credit and mainstreaming of small-scale mining loans by the formal financial institutions. The strategies might include: (i) Supporting the formation of formal enterprise groups such as miners' associations with commercial companies etc. (ii) Formalising traditional funding systems by promoting the following: hire-cum-purchase systems, forward sales, and mutual group savings schemes.	Macfarlane and Mitchell 2003

Type	Key Strategies, Regulations, Initiatives, and Best Practices	Reference
	(iii) Encouraging banks to develop mine finance expertise and to establish mobile banking systems, as well as commercial banks in the mining areas. (iv) Encouraging financial institutions to support small-scale mining by formulating affordable credit schemes for the sub-sector and adjusting start up capital requirements. (v) Promoting the use of third party guarantees to enable other institutions to assist miners to get loans. (vi) Facilitating the creation of mineral property markets to enable discoverers to sell their properties to developers at competitive prices. (vii) Working, in conjunction with NGOs, towards the establishment of miners' co-operative banks, and informal financial institutions such as rotating savings and credit associations. Advocating efforts to increase miner's incomes through value added activities. (viii) Putting in place a mining trust fund to finance simple mining equipment and other inputs and devising and effective mechanisms for the replenishment of the fund. (ix) Conducting awareness programmes to promote a savings culture among small-scale miners.	
Policy	Necessary reform of the ASM sector may include: - Ensure appropriate legislation for ASM: Acknowledge and reflect the ASM sector in national legislation and codes. - Revisit existing ASM policies and legislation and implications for traditional land rights; modern land use legislation and role of central government; update rules, regulations, and legislation. - Adopt appropriate and enforceable Health and Safety guidelines. - Adopt appropriate and enforceable environmental guidelines. - Establish partnerships with NGOs. Ensure gender equality. - Launch child labour reduction programmes. - Provide credit facilities, and co-operative saving schemes. Make available credit and loan schemes, micro credit, and credit co-operatives. - Ensure free and equitable markets.	Harrison et al 2003
Policy	The jewellery industry should commit itself to monitoring, in a consistent and credible way, its suppliers – rejecting those that do not comply with recognised core labour and environmental standards.	Harrison et al 2003
Programme	Small-scale mining encompasses social, environmental and economic issues and therefore, any strategy to improve the livelihoods of small-scale mining communities must necessarily be cross-sector. This means that any strategy must also facilitate the development of links between the mining community and stakeholders at the micro and macro levels. The Sustainable Livelihoods approach (SL) offers both a conceptual and programming framework for poverty reduction in a sustainable manner. Conceptually, livelihoods connote the means, activities, entitlements and assets by which people make a living. Assets, in this particular context, are defined as not only natural/biological (namely, land with precious stones, water, common-property resources, flora, fauna), but also social (i.e., community, family, social networks, participation, empowerment, human (namely, knowledge creation by skills) and physical (namely, roads, markets, clinics, schools, bridges). The SL approach, by using both policy	Ibid.2003

Type	Key Strategies, Regulations, Initiatives, and Best Practices	Reference
	(cross-sector) and participatory tools, highlights the links between livelihood systems at the micro level and the macro policies, which affect mining community livelihoods. Understanding such processes offers constructive advice to partner governments on how current policies and programmes can be re-oriented to better serve the needs and capacities of mining communities.	
Programme	Identify alternative livelihoods strategies realising that ASM is a finite venture: - Integrate ASM sector into rural community development programmes. - Stimulate capacity-building, and technical and organisational development. - Facilitate access to basic social services and transport infrastructure development. - Streamline marketing channels.	Ibid. 2003
Practice	Particular training material should be developed for use locally, nationally and regionally. Materials (e.g. leaflets) should be available for a range of significant issues, e.g.: - Raising awareness regarding health and safety in ASM. - Raising awareness regarding the use of child labour. - Raising awareness in relation to environmental protection and management. - Raising awareness regarding women's rights and working conditions. - The development of trade unions. - Prevention of HIV and other sexually transmitted diseases.	Ibid. 2003
Practice	The development and introduction of low cost, technically appropriate, mining practices to reduce health and safety risks. For example, active pumping for ventilation in deeper pits and the use of terraced face cutting techniques in large pits to prevent collapse and slumping. The provision of appropriate technical advice for limiting the environmental impact of gem mining. For example, the use of settling ponds to reduce contamination of the water supply and the correct stockpiling of excavated materials for latter back-filling of pits. The provision of incentives by government to participate in the schemes suggested above. For example the use of unemployed miners to drain and backfill old pits in exchange for enhanced benefit payments and a reduction or refund of part of the license fee for correct remediation of gem workings.	Ibid. 2003

Box 1.6. Cooperation between ASM and large-scale operators

Exploration: during this period the large companies may enter into an agreement with small-scale miners so that the larger companies are able to access the license area of the small-scale miner. Provision is made in the agreement to allow the company to buy out the small-scale miner if he/she wishes to do so, depending on the potential value of the property. In those areas where there are insufficient resources to justify a mine, the areas are left for the small-scale miners to continue with their activity.

During mine development and production: in areas where large-scale mines are operating, the companies may be encouraged by government to continue working in partnership with artisanal miners and the community, particularly in cases where artisanal miners have released land for the large-scale mining operations. Companies may also be encouraged to design programmes that assist small-scale miners with management, operation and marketing issues. Other areas of assistance include environment protection and preservation.

To enable such co-operation several elements are essential:

- sustained development in general and to mineral resources development in particular.
- investment, with a climate of partnership between industry and government at the highest level.

Summary of Key Points

Background

- The gemstone industry is comprised of distinct diamond and non-diamond sub-sectors.
- The vast majority of non-diamond gemstones are mined in low cost, widely dispersed artisanal and small-scale (ASM) mines in remote regions of developing countries.
- Countries with major non-diamond gemstones and gemstone production, include Brazil, India, Tanzania, Mali, Sri Lanka, Madagascar, Thailand and Mali.

Key Issues

- Rural livelihood choices in marginal environments and remote regions are dwindling.
- There are rapidly increasing numbers of people seeking livelihoods in ASM.
- There is increasing pressure on available environmental and social resources.
- There are limited public budgets for investing or regulating the ASM sector.
- There is increasing gender inequality and use of child labour in ASM.
- Significant concerns for environmental damage and health and safety of ASM.

Social and Environmental Impacts

- There are a wide variety of negative environmental impacts, which are physical, hydrological, atmospheric and ecological in nature.
- Many of the environmental impacts of ASM are preventable and affected by location, timing, mining method and technology adoption.
- The social impacts of ASM are both positive and negative, direct and indirect. They generally relate to health, livelihoods, economics, and culture.
- The most significant negative social impacts are an indirect effect of impacts on the environment as well as a lack of investment in equipment and training.

Existing and Recommended Policies, Programmes and Practices

- Most gemstone producing countries have environmental and social policies relating to ASM, however, they rarely have the power to enforce these policies.
- The focus has therefore shifted from legal and technical policies, to policies that assist the ASM sector as part of a general poverty alleviation strategy.
- Through this strategy, current ASM policies and programmes do not aim to exclude ASM, but to minimise its negative impacts and enhance positive impacts.
- Many successful programmes and practices at the operational level involve institutional support for ASM and partnership with large mining companies.

2. Large-scale Mining and Processing of Silver

Background to silver mining

Silver, as is the case with most metals, is traded as homogeneous, fungible commodity. There is little scope for product differentiation between individual producers and, assuming a standardised product quality, competition is based predominantly on cost. The commodity market therefore provides a considerable incentive to produce at the lowest cost, particularly since marginal high-cost producers will be pushed out during cyclical downturns in demand. In effect this means that end-users of silver have little control or knowledge of where that silver comes from, or the environmental and social impacts associated with its production. This can be a major impediment to users wishing to implement an ethical trading programme relating to upstream suppliers.

The vast majority of silver production from mining occurs at a large rather than at a small-scale. The relevance of ASM to silver mining is therefore limited. Table 2.1 shows the annual silver production generated by the 20 largest silver companies. These operations produced 52% of the total mined silver in 2001.

Table 2.1. Top 20 silver producing companies, 2001 (Silver Institute, 2002)

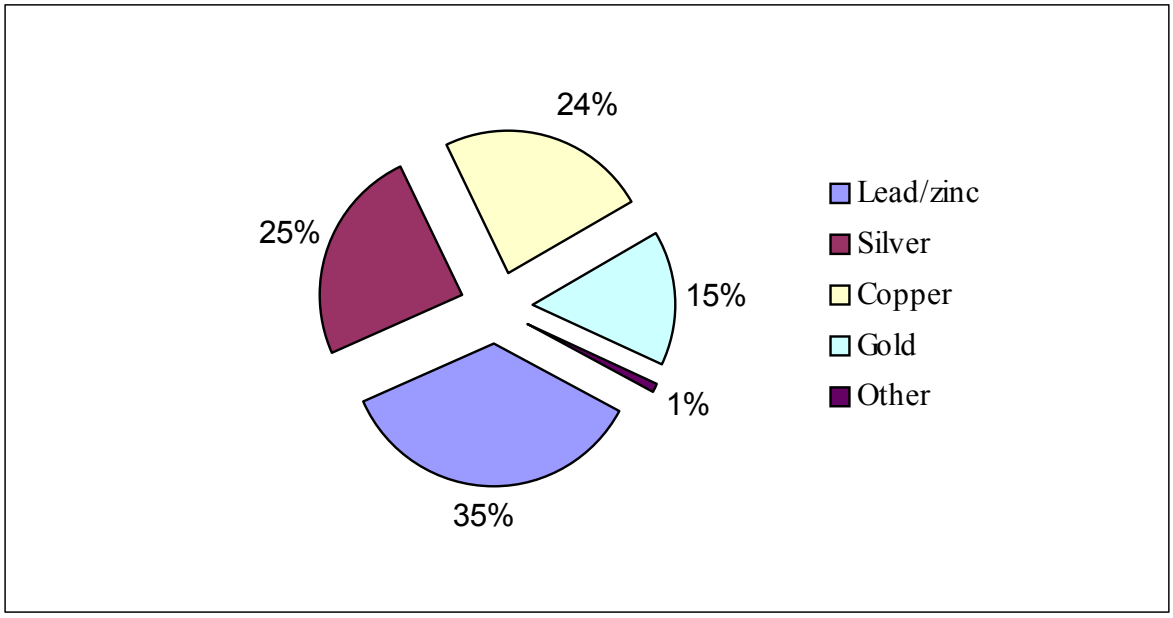
Rank	Company	Country	Production (million ounces)
1	Industrias Peñoles	Mexico	51.7
2	KGHM Polska Miedz	Poland	37.4
3	BHP Minerals	Australia	33.0
4	Grupo Mexico	Mexico	22.1
5	Rio Tinto plc	UK	17.7
6	Homestake Mining	USA	15.5
7	MIM Holdings	Australia	13.8
8	Cia. de Minas Buenaventura	Peru	12.5
9	Pasminco Ltd.	Australia	11.8
10	Coeur d'Alene Mines Corp.	USA	10.9
11	Volcan Cia. Minera SA	Peru	10.7
12	Codelco	Chile	10.4
13	Noranda Inc.	Canada	9.3
14	Boliden AB	Sweden	8.9
15	Société Métallurgique d'Imiter	Morocco	7.9
16	Comsur	Bolivia	7.8
17	Hecla Mining Company	USA	7.4
18	Pan American Silver	USA	6.9
19	Placer Dome Inc.	Canada	6.8
20	Echo Bay Mines Ltd.	USA	6.5
		Total	309

When considering the environmental and social impacts of silver mining, it is important to recognise that more than two-thirds of world silver resources are associated with copper, lead, and zinc deposits. The remainder is in deposits in which gold is the most valuable metallic component. In many mines, the primary product is one of these metals, with silver being a by-product. The natural occurrence of silver in association with a variety of other metals explains the dominance of by-product or co-product silver in total mine supply and the production of significant quantities of silver from

operations where it is not the primary target nor the principal earner of revenue. In fact, in many cases, silver is regarded as a 'bonus' of base metal or gold mining (Silver Institute, 2002.

In 2001, analysis of the sources of silver mining production shows that three-quarters of output was generated as a by-product of other metals (see Figure 1). This is, in part, a consequence of the scarcity of large silver deposits, which can be economically exploited at prevailing silver prices.

Figure 1. World mine production of silver by source (2001 data) (Silver Institute, 2002)



The extraction of silver is largely driven by demand for copper, lead, zinc or gold. Even where silver is the primary metal of interest, other metals are generally present (see Box 2.1).

Box 2.1. Cannington Silver Mine, Queensland, Australia
The Cannington silver mine is located in northwest Queensland. The deposit was discovered by BHP Minerals in 1990 and commissioned in 1997. It is the world's largest single silver producer, representing about 5 % of the world's primary silver production, with an estimated 750 t of silver contained in 265,000 t of lead concentrate and 110,000 t of zinc concentrate. The lead production represents about 7% of the world's primary lead output. Therefore, despite being termed a primary silver mine; it also produces extremely significant quantities of other metals.

At some mines, the silver is the sole product or main co-product (these are called 'primary' silver mines). Primary producers are also dominated by large-scale operations (see Table 2.2), with the top 15 producers generating 21.5% of total global production in 2001 and 86% of silver produced from primary silver mines.

Table 2.2. World's leading primary silver producers, 2001 (Silver Institute, 2002)

Mine/Location	Operating Company	Production (million ounces)
Cannington, Australia	BHP Billiton	29.99
Proaño*, Mexico	Industrias Peñoles SA de CV	28.74
Greens Creek, U.S.	Kennecott/Hecla Mining Co.	11.00
Uchucchacua, Peru	Compañia de Minas Buenaventura SA	9.78
Tizapa, Mexico	Industrias Peñoles SA de CV.	8.13
Imiter, Morocco	Société Métallurgique d'Imiter	7.90
Rochester, U.S.	Coeur d'Alene mines Corp.	6.35
Galena, U.S.	Coeur d'Alene Mines Corp.	4.51
Arcata, Peru	Minas de Arcata SA	4.44
Quiruvilca, Peru	Pan American Silver Corp.	3.26
Lucky Friday, U.S.	Hecla Mining Co.	3.22
Huaron, Peru	Pan American Silver Copr.	2.90
San Martin, Mexico	First Silver Reserves Inc.	2.39
Cayllom, Peru	Hochschild Group	2.25
Martha, Argentina	Yamana Resources (sold to Coeur, April 2002)	1.70
	Total	126.56

Therefore, the environmental and social impacts of silver mining are more complex than they first appear, as in fact they relate to three distinct types of operation:

- Recovery of silver as a primary or by-product from gold mining.
- Recovery of silver as a primary or by-product from lead-zinc mining.
- Recovery of silver as a primary or by-product from copper mining.

The analysis in annex 1 considers the environmental impacts of each of these types separately, as the geological and mineralogical factors and the type of mining method and technology used are different for each, and it is from these that the exact types and potential magnitude of environmental impacts often stem. Potential social impacts can be assumed to be more generic, with the main differences relating to gold operations that use specific chemicals (e.g. cyanide and mercury) not used in lead-zinc or copper operations.

However, more important than the type of operation may be the nature of the regulatory and enforcement capacity in the country of production. Table 2.3 shows the top 20 silver producing countries in 2001. It is clear that there is a significant spread of regulatory systems and enforcement capacity, from countries with strictly regulated and enforced environmental protection (e.g. United States and Australia) to countries that may have environmental regulations, but limited enforcement capacity (e.g. China and Russia). In practical terms, the capacity to enforce regulation and effectively police operations may be the biggest determining factor in the nature and extent of environmental (and social) impacts.

Table 2.3. Major silver producing countries, 2001 (Silver Institute, 2002)

Rank	Country	Mine production (million ounces)	% of global production*
1	Mexico	90.8	15.4
2	Peru	86.0	14.6
3	Australia	63.3	10.7
4	United States	52.6	8.9
5	China	48.9	8.3
6	Chile	43.4	7.4
7	Canada	39.7	6.7
8	Poland	38.0	6.4
9	Kazakhstan	24.3	4.1
10	Russia	20.1	3.4
11	Bolivia	13.7	2.3
12	Morocco	9.4	1.6
13	Indonesia	9.3	1.6
14	Sweden	8.8	1.5
15	Argentina	5.3	0.9
16	South Africa	4.2	0.7
17	Turkey	3.6	0.6
18	Japan	2.6	0.4
19	Spain	2.2	0.4
20	Papua New Guinea	2.2	0.4
	Total	568	96.3

* Based on total production in 2001 of 590 million ounces

Key issues and challenges

Hudson (1998) noted that the top-priority environmental problems associated with large-scale metal mining were:

- Limited understanding of bioavailability of metals in mining wastes.
- The environmental impacts of metals in solid mining wastes.
- Acid rock drainage.
- Contaminated groundwater.
- Surface stabilisation and erosion control.

These are broadly in line with those facing the silver mining industry - concerns about other minerals normally present in terms of environmental impacts, bio-availability, and generation of acid rock drainage being highly significant, as is the requirement to control the erosion of sediments and wastes into surface waters. Other issues include:

- The legacy of past mining activities that took place at a time before environmental and social issues were considered – this is a universal problem that the mining sector faces, and it is often criticised in terms of today's regulations for practices that were legal and in compliance at the time of the activity. Dealing with this

issue is extremely problematic – companies are loath to address such legacies for fear of being seen to admit or accept liability and responsibility. In many cases, the real environmental impacts relate more closely to past, rather than present activities. The industry should therefore explore regulatory, voluntary and fiscal approaches to the gradual reclamation of those historic and abandoned operations that are likely to impact on its ability to operate in the future. In the US this approach has included examining the potential for abandoned sites to be reworked with the liability for environmental impacts remaining with the state or Federal government. This removes the liability risk as a major obstacle to restoration through reworking (this applies to sites where the reworking is undertaken by a company other than that originally responsible for the environmental impact).

- The remediation of existing mine sites represents a significant opportunity to develop new and innovative technologies for reprocessing of mine wastes and the development of policy and technical procedures to promote, where possible, the utilisation of secondary wastes rather than primary resources. Increasing constraints relating to the exploitation of primary resources have elevated wastes into potential resources themselves. However, regulatory standards and quality standards may impede the use of innovative technologies, and there may also be technical barriers to the reprocessing of certain complex waste materials. Innovative technologies may also have limited cost and performance information that in turn generates a lack of incentive to invest in innovative technologies.
- The environmental impact resulting from the presence, extraction, processing and/or disposal of accessory minerals, in particular metal sulphides.
- The mismanagement of the mining process – for example leaving unacceptable 'scars' on the original environment through failure to backfill or otherwise restore mined-out areas.
- The mismanagement of waste disposal, which becomes more significant where the majority of extracted material must be disposed of as waste. Mismanagement may result in physical and chemical impacts on the environment depending on the nature of the deposit's mineralogy.

With respect to social issues, the construction of mines close to communities (or the development of communities to support mines) can lead to broader community impacts which affect the quality of life of residents, such as inflation, rising crime, noise, and dust. Social structures can also be impacted by an influx of new people associated with the mining operation, particularly in those cases where the division of wealth and access to facilities is perceived as being less than equitable. Depending on the nature of the relationship between the operation and the community, the benefits of increased employment, local revenue and improved facilities are not always recognised. Indeed, in some parts of the world, the mining operation may actually entirely replace the role of the state in supporting communities as part of their 'license to operate' (Warhurst 1994).

In recent years, however, the mining industry as a whole has withdrawn from this 'benign paternalism' approach due, in particular, to problems caused at mine closure by years of community dependency. Even when a long lifespan is anticipated for a mine, the concept of an isolated community as a model for settlement, is becoming increasingly unpopular in many countries, as these settlements are vulnerable to

economic swings and cycles, leading to social disintegration and worker displacement if a mine closes. However, in the context of many developing countries, implementation of integrated resource centres may not be practical, while the significant role of the informal and small-scale mining sector reduces the potential for fly-in/fly-out operations (Wood and Macfarlane 1997).

In terms of briefly analysing the other key social issues and challenges associated with large-scale mining, it is simplest to take a thematic rather than temporal approach and to divide these issues into the four broad and inter-connected categories of health, culture, economics and livelihoods. In relation to health, the generation of excessive atmospheric particulates or dust is of particular concern at open cast mining ventures where activities such as soil stripping and dumping, heap leach crushing, blasting, open pit drilling, ripping and haulage all act as particulate generators. Atmospheric dust caused by mining activities like these has the affect of raising the incidence of respiratory infections such as tuberculosis in the mining communities. Much of this dust can be made up of silica that has its own brand of pneumoconiosis in the form of silicosis (SGS 1996a).

The impact of mining on the aquatic environment is an issue that attracts considerable attention. In a paper specifically addressing the indirect social impacts of mining, Parker (1996) states that any adverse effects due to mining on the hydrological environment of developing countries will tend to have a corresponding affect on the health of local communities. In many parts of the developing world, mining communities depend on untreated surface and ground waters as their main water supplies, used for drinking, washing and food preparation. The use of chemical solutions such as cyanide, mercury and arsenic to extract soluble ore, known as the 'leaching' process, are often left untreated, either in large pools or allowed to seep into the groundwater, posing a particular health risk to those dependent on, or exposed to, this natural resource.

Pintz (1984) identifies that the release of pollutants into the hydrological environment has been the principal legacy of the Ok Tedi mine in Papua New Guinea. Waste from the mine, 100,000 tonnes a day of sediment and tailings containing chemicals like cyanide, dissolved copper, zinc and cadmium, is routinely discharged into the head-waters of the river system. Chambers (1985) discovered that the mine waste is causing blockages to the Maun river and its tributary streams, resulting in regular flooding and the deposition of vast quantities of sediment on the surface of 10,000 hectares of formally fertile agricultural land and luxuriant tropical rainforest. Subsequent formal environmental evaluation by Dames and Moore (1996) revealed that the mine tailings would contaminate the river for over two decades, affecting the health of an estimated 35,000 people who depend on the river for food preparation, washing and drinking.

In tropical regions, alterations by mining to the hydrological environment can increase the risk of malaria. The excavations and tailings ponds associated with mining create stagnant waters that can become breeding grounds for malaria carrying mosquitoes. Resurgence in the incidence of malaria is one of the most worrying changes in disease patterns in recent years in the Amazon basin, where mining activities are most concentrated. This had a particularly devastating effect on the indigenous Indian populations, who have no resistance to the emerging strains brought by migratory miners, and have little access to modern medical facilities. In a paper evaluating the

impact of mining on malarial incidence in Brazil, Sawyer (1992) reports that in 1990 the mortality of 60% of Yanomami Indians of northern Amazonia, whose lands have been subject to mining incursions since the mid-1980s, was attributable to malaria.

The noise effects of mining associated diggers and blasting can also have a debilitating impact on health. The vibration effects of blasting and digging can result in the structural degradation of buildings, rendering them unsafe for habitation, while the noise effects can have an adverse impact on mental and physical health. In their study of the impact of mine blasting in Ghana, Tsidzi and Adofo (1995) note that it has interfered with human activities such as sleep, speech and hearing as well as inducing stress-related illnesses such as hypertension. In addition, as a consequence of mining, land is often denuded by ugly high profile waste dumps and excavations, and stripped of its vegetation. Unless these effects are mitigated through re-vegetation and landscaping the aesthetic appeal of an area can be dramatically reduced which can affect psychological health (Wilson 1982:42).

Boothroyd et al (1995) describe the potential cumulative impacts of concurrent or large-scale mining developments as creating elements of the 'boomtown' scenario. This scenario is characterised by increased levels of crime and violence, drug and alcohol abuse, family stress, community instability, depression, school drop-out, juvenile delinquency, welfare caseloads, drunkenness, suicide, child abuse and teenage rebellion (Kohrs, 1974). Wilson (1982) found that the social environment of the Weipa mine typified this scenario and included the highest rate of Aboriginal imprisonment in Australia, profoundly high levels of violent crime, self-inflicted harm and other convincing signs of social and psychological malaise. Wilson concluded that 'traditions have disappeared and alcohol has wreaked havoc…'

The Ranger Uranium Enquiry (Fox et al, 1977) foreshadowed alcoholism as the single most serious social impact to be created by the incremental effects of mine development. Although excessive drinking rarely impacts whole communities, the minority involved can disproportionately affect the rest of the community. Kesteven (1984) isolates associated problems of alcohol abuse in mining areas such as violence, accidents, neglect of community responsibilities and suicide. However, as O'Faircheallaigh (1991) and Tatz (1982) point out, among Australian Aboriginals, it is difficult to know if alcoholism can be attributed to mining since drinking habits were often firmly entrenched prior to mine development. Nevertheless, both authors agree that mining increased overall alcohol consumption and associated problems.

Some of the most significant cultural impacts of mining are associated with the process of displacing people from the land to be mined. In rural communities land is often the major economic and cultural resource available to its members. It can serve as a basis for livelihoods, a place of habitation, a medium of social exchange, a focus of cultural and spiritual belief and a sign of power and status for contemporary and future populations (Roper 1983). Therefore, rural communities often have a very strong attachment to land, forged by notions of culture and the realities of survival. Displacement from this land by new or existing patterns of surface and mineral ownership, can become a very emotional issue for the recipient communities and often leads to major conflicts with the mineral developers (Misra 1994).

The issue of land conflict was particularly stark and well documented at Bougainville Copper Ltd's, Bougainville mine in Papua New Guinea, and eventually culminated in the islanders seizing control of the mine from the operators. Prior to this, however, increased social agitation at the mine led to Applied Geology Associates Limited (AGA) being contracted to determine the cause of the unrest. Both AGA (1989) and Emberson-Bain (1994) concluded that the most serious physical and psychological impacts of the mine undoubtedly derived from land clearances occurring during mine project development.

Literature from Australia further illustrates the destructive effect that the loss of land to mining can have on communities. Ross (1990:17) writes about the 'cultural decay... and sense of failure' Aboriginal people felt after losing their ancestral lands to mining. The author stresses that the Aborigines continue to be gravely concerned for future generations, seeing the loss as evidence of their own failure to preserve ancestral land for their children and grandchildren. Researching Walpiri Aborigines, affected at the time by mining at the Granites, Howitt (1992:132) found notions of landscape to involve an important synthesis for them; '…the country not only contains our ancestors bodies, but also reflects the metamorphosed imprints of their body parts'.

In addition to the displacement of communities from the land, the potential employment opportunities associated with mining have attracted large and diverse migratory populations which frequently outnumber the entrenched population, historically establishing a link between mining and social problems.

In a study assessing the social impacts of privatisation of Brazil's Timbopeba and Capanema mine, Wright (1997) found that during the first decade of operation, the population of towns in the surrounding complex had increased by as much as 50%, with smaller communities often doubling or tripling in size. In some respects this population increase was considered beneficial, with the influx of new migrants, in the short run, contributing to a revival of the demographic structures of the receiving areas. Overall, however, 85% of the residents interviewed in Wright's research considered the impacts of the population increase to be negative, indicating particular concern over housing shortages and inflationary rents.

As well as impacting on the availability of housing and the level of rents, there are impacts stemming from the contrast between the social and cultural characteristics of the newcomers, their lifestyles and expectations, and those of the entrenched population. Many of these differences derive from rural and urban norms, documented in the sociological tradition of Durkheim (1933). These contrasts can place considerable stress on existing social relationships, based as they are on a specific set of rules and expectations. People often feel overwhelmed by this change, and unable to adapt. Freudenburg (1980) goes as far as to say that this change can be completely destructive to the existing informal mechanisms of social control in the host communities.

The rate of population growth can be a critical determinant of subsequent social impacts (Sharan & Sharma 1994). Gilmore (1976) estimated that resource based communities can readily absorb a five percent annual population increase but experience many problems when growth rates exceed 15 percent, which can be common in mining communities (Himelfarb 1983). These problems are compounded by the transience of a

mining population. Migrant workers are attracted to the community for short-term gain, with little incentive to form attachments to the area or adapt to local social norms.

Moreover, migrant workers are typically young and skilled and more likely than locals to be gainfully employed in the mine (RSS 1993). The wages they receive can cause huge disparities of wealth in a concentrated area and contribute to the consolidation of a cash based economy within traditionally subsistence based communities, which can be unsustainable following mine closure (Clark 1996, Warhurst & Macfarlane 1999).

In addition to debilitating the vitality and spirit of the community, the influx of a migrant population can increase the potential for conflict. Burdge (1987) lists antagonism between established community members and newcomers to industrial projects as a major category of social impact. The conflict is generally multifaceted and can encompass religious, customary, moral and natural resource issues. According to Clark (1996), where there is a culture of respect and power according to seniority, or a disdain for individual consumptive wealth, a major axis of conflict tends to be between the younger migrant workers and the older generation of host communities. The money earned by younger migrant workers can make them a very influential group able to challenge the traditional lines of power and authority in host communities.

A particularly widely documented source of conflict at mining operations concerns the issue of sexual practice. Researching Guyana's mining sector Canterbury (1997) found that Aboriginals were especially angered by migrant mine workers engaging in the sexual exploitation of Aboriginal women. Similarly, Tsinoung et al. (1989) note that the residents of Bougainville expressed considerable discontent that CRA[1] staff were trying to turn Bougainvillian women into prostitutes. At the Ok Tedi mine in Indonesia, Hyndman (1992) found that the incidence of adultery and prostitution had become rife where it had previously been rare. Howitt (1989a) reports on Aboriginal women who became the victims of sexual 'relief' sought by Hamersley workers on the Roebourne reserve in Australia. He documents the problem of the 'kids that are not true' resulting from sexual liaisons between migrant mine workers and local women, who were rarely in receipt of any subsequent financial or paternal support.

At many new mining sites, indigenous landowners have received compensation for the use of their land and the damage done to it. On the one hand, compensation represents considerable benefits for local communities affected by mining. O'Faircheallaigh (1984) highlights the case in 1981, of an Aboriginal group in the Alligator Rivers uranium mining area receiving compensation payments which averaged $6,500 per head, when their annual income prior to mining was only averaged $230 per head. These incomes are far short of warranting the held assumption that Aborigines in the region had become 'uranium sheikhs', but such payments can contribute significantly to the existing livelihoods of the recipients.

On the other hand, mine compensation can be detrimental to communities. Used in isolation, compensation can introduce the most mercenary elements of an often-alien cash-based system of exchange. For example, Howitt (1992) reports that the distribution of mine compensation payments caused constant competition and antagonism among the aforementioned Walpiri over individual entitlements. Another

[1] Conzinc Riotinto of Australia, principal owner of Bougainville Copper Ltd.

concern is that increases in disposable incomes from compensation payments can create significantly higher expectations among the recipients that may be difficult to fulfil once the mine has been terminated. Other negative social impacts can emanate from the inequitable and volatile levels of compensation payments. This stems from the arbitrary nature of land valuation procedures; confusion over land entitlement claims; fluctuations in the profits of the companies; and a tendency to distribute compensation exclusively to landlords rather than the tenants of properties (Robinson 1992).

Recognition of these problems has led some mining companies to adopt the alternative policy of relocation. This refers to the provision of land and property for community members at a more distant place. Relocation is regarded to have the advantage of maintaining social cohesion and minimising disruption to other aspects of community life. However, relocation is also fraught with its own problems. After evaluating a mine relocation program in Northern India, Bhandari (1994) comments that, 'the area to be designated for the relocation of Rampura village is unpromising land for an agricultural community… it will result in the formation of a severely disadvantaged community'. Similarly, a study of Sierra Rutile Limited's mine in Sierra Leone by Friends of the Earth, concluded that while the new settlements offered enhanced infrastructure, the associated land was too poor to establish crops (Kamara 1997:25).

The social issues referred to thus far have been largely negative. However, common arguments favouring mining, particularly in developing countries, are that positive social effects will result from its investment activities and revenue generating capacity. Radetski (1994) shows that, in addition to the initial capital investment, the operational investment of mining can extend further into the domestic economy through the promotion of 'backward' and 'forward' linkages and the development of infrastructural facilities. Mining can also provide a significant source of revenue through profit related royalty payments and through fixed taxation (Waelde 1992). Anderson (1996:1) suggests that these incentives spur 'many communities and governments to frequently, and aggressively, seek mining projects', resulting in countries making adjustments to their mining laws to attract foreign mining investment.

The injection of mining investment and revenues, with its commensurate impact on 'spin-off' employment, into areas that are often cash starved can also entail a rise in material living standards. This has enabled many mining communities to greatly extend the range and quantity of items they consume. O'Faircheallaigh (1991:246) cites comments from Aboriginal women at Oenpelli mine in Western Australia about their pleasure at being able to afford washing machines and refrigerators. The possibility of purchasing motor vehicles was also regarded as an important benefit, liberating access to services such as hospital care and food suppliers. Diets, in particular, have often been greatly transformed, in some areas contributing to improved nutrition, although in other areas a growing dependence on imported foods has led to a growth in non-communicable diseases such as obesity, hypertension and diabetes (Ulijaszek 1987).

A number of commentators stress that the nature and extent of the positive social impacts from the investment activities and revenue generation of mining projects may be overemphasised. Reviewing the social impacts of investment initiatives by mining companies in Asia, Australia and Africa, O'Faircheallaigh (1984) concludes that on the whole the impact '…is largely determined by existing patterns of economic and social activity'. Furthermore, Auty (1995) and Jauch (1996) argue that lower transport costs

through investment in infrastructure make it easier for mining projects to import their inputs and process nearer the markets, actually reducing the incentive to promote domestic linkages. In addition, Abugre and Akabzaa (1998) note that the bulk of new mining investment is in precious and metallic minerals, with limited investment in non-metallic ores which have higher linkages to domestic industry.

A growing realisation of the more limited benefits of current mining investment underlies the conclusions of the UN Economic Commission for Africa (ECA 1997:24) that 'the African mining sector is making no decisive contribution to the social and economic development of Africans'. Connell and Howitt (1991:1) are particularly critical of mining's record on human development, finding 'few circumstances where the indigenous group's development goals have been successfully linked to those of the mining corporation'. Nevertheless, enough examples of mining companies making investments directly into the social and economic development of their local communities are now emerging to suggest that this situation is changing.

Western Mining Corporation is one company that has been at the forefront of community development in recent years. According to Davis (1997b), management at their proposed Tampakan mine in the Philippines has made a commitment to a three year community development programme, which will proceed regardless of whether or not mining proceeds. The company's community development workers live in the region and work with the Bla'an people to develop this programme, 'based on their needs and aspirations, recognising their right to plan their own future' (Ibid.1997: 37).

Among the social impacts emanating from mining investment and revenue generation, the potential for employment creation is particularly well expounded. To illustrate this, Redwood (1997) cites Companhia Vale do Rio Doce's Carajas mining project in Brazil. Employment at Carajas is of the order of 4,200, and at the peak of construction activities nearly 24,000 contract workers were engaged in project implementation. Ironically, given its troubles, Quodling (1991) found that Bougainville mine also provided an excellent example of mining generating employment and imparting skills locally. The Strategy of BCL was to train the indigenous people of PNG in technical and administrative roles based on an apprenticeship and educational scholarship scheme. By December 1988, BCL employed 3,560 people, 83% of whom were PNG nationals and 20-25% of whom were indigenous Bougainvillians.

There is increasing concern, however, that local employment strategies like those at BCL may be the exception rather than the rule and that most of the employment benefits of mining are not localised. Boothroyd et al (1995) review of the impacts of large scale mines in Canada suggests that the proportion of mining jobs filled by existing local residents were generally less than 5% and that these tended to be in low paid, low skilled and temporary positions. Moreover, Lanning and Mueller (1990) contest the assumption that mining now offers significant direct employment, either at the local or at the national level. They argue that the general employment benefits of mining have been reduced by a trend towards capital intensive mining where production and processing is based on '…a relatively small core of permanent expatriate employees' (Cox 1994:47).

Increasingly, the relatively low rates of direct mine employment are being justified on the basis of its potential for 'spin off' employment. Howitt (1991) and Young (1995),

for example, note that the Yirrkala Business Enterprises, an Aboriginal company concerned with a number of subsidiary activities associated with the Nabalco bauxite mine on Arnhem Land's Cove peninsular in Australia has been particularly successful in terms of securing 'spin off' employment. Its activities now include contracts for; earthworks; rehabilitation; beautification; garbage collection and a contract with the Northern Territories Department of Transport to maintain mine roads.

Also directly related to livelihoods is the issue of resource availability, in particular the effects on livelihoods of the loss of land already noted. In addition, Marcus (1997) notes that the loss or conversion of habitats associated with the clearing and exploration of mined areas can have one of the most significant impacts on traditional livelihoods. Deforestation has had a particularly dramatic affect on natural habitats (Mondal et al.1994). At Freeport's Grassberg mine in Indonesia, Ondawame (1977) considered rainforest clearance to be responsible for heavy rains removing vegetation and reducing the fertility of soil used by locals for producing basic crops.

Large-scale mining is clearly associated with a number of negative issues and challenges. However, to adopt a purely adversarial position against mining denies a number of successful negotiations and developments that created 'win-win' situations for all stakeholders. In many cases, mining represents the only modern industry likely to be interested in locating facilities and investing in areas that can be extremely remote. It is often the only means people have of involvement in the wider economy and, for most people, isolation from the processes of economic development is not seen as a possible or necessarily desirable state (Jackson 1988).

Mining therefore poses a means of helping to achieve locally defined economic and social goals. However, in a world economy that includes substantial international trade in mineral commodities, most major mining projects are orientated towards distant, usually international, opportunities rather than local development priorities (Connell & Howitt 1992). Literature on mining and social impacts reflects this and suggests that, to date, there have been more corporate than local winners in the process. In many parts of the world, economic 'booms and busts' found in communities formed around mining, have turned to continuous bust, persistent poverty and political volatility (Freudenberg & Grampling 1994). Displacement, alienation, conflict and other, often tragic, dimensions have been the legacy of vast numbers of mining operations. Songsore et al's (1995:3) evaluation of the role of mining in promoting growth in the Ghana, concludes that:

> *'Whereas most of the social costs are borne by the local society, most of the benefits remain in the hands of the mining companies, and to a lesser extent the central Government'.*

Environmental and social impacts of silver mining

Although permanent, temporary or transient environmental impacts are common; their association with mining and milling operations is not inevitable. For example, of 33 mining and milling operations surveyed in 1989-90 by Environment Canada, approximately half had no adverse environmental impacts, while a further 15% had only minor effects. However, as is the case for many heavy, process-orientated sectors, mining has had limited success in altering the widely held perception that it must be an intrinsically 'dirty' and polluting activity. Despite pro-active initiatives in the fields of

waste management and pollution prevention, societal perception of the general industry continues to revolve, to a large degree, around consideration of 'sins of the past' rather than current and state-of-the-art operations.

Dynamic companies have responded to societal perceptions and other drivers by improving environmental performance as part of the renewed drive for competitive edge. In many cases environmental performance and standards continue to improve. Companies are now beginning to operate within the regulatory standards and guidelines of their home country at overseas sites where less stringent legislation or enforcement would otherwise apply. This shows that a commitment to minimising environmental impacts is growing and that competitiveness and enhanced environmental performance are not mutually exclusive. Similarly, it is becoming increasingly clear that technological incompetence is not compatible with sustainable development.

Consequently, mining, mineral processing and extractive metallurgical technologies all play a significant role in determining the environmental performance of an operation and its contribution to regional and national development in a sustainable manner. However, limitations arising from the choice of technology can potentially undermine even the best efforts in environmental and human resource management and stakeholder consultation.

The specific nature of environmental impacts relating to silver-related mining will ultimately be a function of whether the silver is produced as a primary or by-product of gold, lead-zinc, or copper. Because of the very technical relationship between environmental impact and means of extraction and separation, these impacts are addressed in Annex (1). There are, however, a number of key environmental impacts that are more generally associated with mining, summarised in Table 2.4. It is, important, nevertheless, to recognise the site-specific nature of these potential impacts. Local and regional factors and the varying perspectives of different stakeholder groups may either aggravate or mitigate the impacts at site-level (see table 2.5). Therefore, while it is possible to generalise to a degree, the nature and magnitude of environmental impacts at each extraction site can vary significantly.

Table 2.4. Overview of environmental impacts and their potential causes

Environmental impact[2]	Potential cause
Water	
Turbidity; smothering of benthic ecosystems	Dredging, suspended solids from creation of infrastructure, dewatering or surface run-off, disposal of wastes to surface waters
Groundwater contamination (e.g. degradation of potable water resources); surface water contamination (e.g. rivers, streams and springs); acute and chronic bio-toxicity (e.g. fish kills, growth and reproduction defects).	Regulated or accidental release of process chemicals, spills or leakage of other chemicals (e.g. mineral oil lubricants, petroleum and derivatives, cleaning agents)
Eutrophication.	Nitrates derived from wash-down of explosive residues
Oxygen consumption.	Presence of inorganic and organic chemicals that consume oxygen during changes in chemical speciation or during degradation
Depression of water table.	Dewatering; hydrological and hydrogeological disruption of surface and at-depth aquifers
Contamination of riverine and estuarine sediments.	Disposal, erosion or dispersion of contaminated solid wastes into surface waters; discharge of contaminated waters and adsorption of contaminants to existing sediments
Diversion of surface waters (e.g. rivers and streams); significant alteration of water flow pathways; depletion of groundwater yield	Extraction and subsequent redeposition of solid wastes into river systems
Creation of stagnant (non-flowing) ponds and larger bodies of water	Extraction
Soil (land)	
On- and off-site contamination of top and sub-soil horizons	Wind and water erosion and dispersion of wastes; transfer from contaminated waters to soil components (e.g. clay minerals, organic matter)
Land sterilisation and/or destruction of vegetative cover (including rare and endangered species)	Disposal of contaminated and/or inert wastes; surface extraction; "footprint" of the processing plant and associated infrastructure; land-take for extraction; temporary or permanent land-use for waste disposal
Inhibition of vegetative regeneration and impact on biodiversity (destruction/disruption of species, forests and aquatic ecological communities; disruption of ecosystem function)	Surface and sub-soil contamination; disposal of waste products not readily re-vegetated
Aesthetic impact	Lack of vegetation; high profile waste disposal sites; open pits; severe topographical disruption (e.g. re-routing of rivers); transient and regular noise; excessive glare from security and/or workplace lighting; destruction of geological forms and landscapes; erosion
Air	
Dust	Creation of infrastructure; wind erosion and dispersion of fine solids (e.g. tailings); crushing; movement of site vehicles; surface blasting; ventilation outlets; transfer points; processing plants; drilling, and loading; truck haulage routes; conveyor haulage routes; fine waste lagoons; blasting; storage areas; waste heaps
Contaminant emissions	Localised occurrences of other process chemicals or degradation products; diesel fumes; smoke; dusts; carbon and nitrogen oxides
Noise	Creation of infrastructure; blasting; operation of heavy plant

[2] Many of these are site-specific, and may not always be significant.

Table 2.5. Examples of mitigating or aggravating site or regional specific factors

Category	Site-specific factor
Land	Nature of terrain Presence of conservation areas Ownership Indigenous land values Adjacent land use Visibility of area Other land use options e.g. ecotourism
Water	Sensitivity of river to erosion, incision etc Variation in rainfall Other uses of receiving water e.g. for subsistence fishing, bathing, washing, and drinking Variation in water flow-rate
Air	Average wind speed Maximum wind speed Wind direction (relative to local communities)
Climate	Length of dry and wet seasons Tendency for drought Frequency, duration and rainfall of storm events
Geology	Depth of overburden requiring removal Concentration of valuable metal(s)
Community	Proximity to extraction site Urbanisation of rural areas Percentage of community employed directly or indirectly at extraction site Presence of local pressure groups
Biodiversity	Sensitive flora and fauna Unique or rare species Fragile ecosystems (aquatic and terrestrial)

Environmental impacts may be *transient* (often acute, associated with spills or accidental discharges), *temporary* (related to operational discharges, ceasing when operations are terminated) or *chronic* (long-term, often those arising from ore extraction and waste disposal). Typical transfer mechanisms are wind and water erosion of contaminated solids or dissolution of contaminants into the aqueous phase. The movement of raw materials and intermediate products off-site for further processing or modification is another mechanism by which the spatial and temporal environmental impact of an operation can be extended. Ideally, any analysis of the environmental burden arising from a particular operation must address the entire life cycle, from material extraction through to the final product, including any and all off-site operations.

Local and regional factors and the varying perspectives of different stakeholder groups may either aggravate or mitigate the impacts at site-level. Therefore, while it is possible to generalise to a certain degree, the nature and magnitude of environmental and social impacts at each extraction site may vary significantly, even for sites with near-identical deposits, extraction, processing and transport methods.

The major source of solid waste from mining and subsequent processing is *gangue* (valueless or sub-economic minerals associated with the target or economic mineral(s)). Depending on the point at which they are rejected from the process, gangue may be disposed of in an as-mined state (e.g. waste rock), as tailings (e.g. following mineral processing), as slags (e.g. after smelting) or as other waste products (e.g. dusts, sludges from water treatment, spent ore from leaching etc). These various wastes may also contain significant quantities of the target mineral or metal due to inefficient processing, technological limitations or mineralogical factors.

In non-ferrous metal mining, gangue is normally the major component of an ore body. Nowhere is this more apparent that in the case of gold where the concentration of valuable material is so low (e.g. normally 5 g t^{-1} or less) that effectively all of the mined ore is disposed of as waste (unless other valuable components such as base metals are also present). Other mineral resources may have less gangue relative to the target mineral, but disposal of gangue-related wastes normally remains a significant issue. Average figures indicate that 42% of the total mined material is rejected as waste rock, a further 52% from the mill as tailings, an additional 4% from the smelter as slag, leaving a valuable component of just 2% of the originally mined tonnage. In effect, such sites are as much about waste disposal as they are about resource extraction.

Potential water contaminants and their sources are summarised in Table 2.6. One of the most serious problems is the generation of contaminated minewater, which collects in mine workings as a result of inflow from rain or surface water and from groundwater seepage. During the active life of the mine, water is pumped out to keep the mine relatively dry and to allow access to the ore body for extraction while surface water is controlled using engineering techniques to prevent water from flowing into the mine. Pumped water may be used in extraction and beneficiation activities (including dust control), pumped to fine waste impoundments, or discharged as a waste. The quantity of mine water generated varies from site to site, and its chemistry is dependent on the geochemistry of the ore body and the surrounding area. Water exposed to sulphur-bearing minerals in an oxidizing environment, such as an open pit or underground workings, may become acidified and contaminated with metals (i.e. acid rock drainage). Sulphide-rich waste rock piles that are permeable to both air and water may also generate acid drainage. Acid rock drainage is widely considered the most serious environmental problem caused by the mining of sulphide ore deposits. If left untreated it can contaminate groundwater and local watercourses, restricting water use and damaging ecosystem and human health. The drainage can be treated, but this is expensive and preventative approaches are more cost effective.

Table 2.6. Potential water contaminants and their sources

POTENTIAL CONTAMINANT	POTENTIAL SOURCES
Non-dissolved contaminants	
Turbidity - suspended solids (silt & sand)	Product, waste and soil erosion Truck movements and wheel washing Washing plant Water treatment plant (e.g. sludge) Run-off during periods of rainfall Waste and product handling and storage activities Exposed quarry faces and benches Drilling Construction activities
Lubricants	Mobile and fixed plant
Waste oils	Waste storage and/or recycling facilities
Petroleum products (e.g. diesel)	Mobile plant Central storage facilities Parking areas
Sewage	On-site toilet facilities
Pathogens	Sewage
Dissolved contaminants	
Heavy metals	Minerals present within site boundaries (e.g. sulphides)
Sulphate	Minerals present within site boundaries (e.g. sulphides) Process chemicals (e.g. sulphuric acid)
Chloride - salinity	Minerals present within site boundaries (e.g. salts) Saline waters trapped within strata present in or adjacent to extraction site
Alkalis	Water treatment plant (e.g. calcium hydroxide, sodium hydroxide) Cement kiln dusts and wastes
Flocculants	Water treatment plant (e.g. man-made polymers)
Eutrophicants (e.g. nitrates, phosphates)	Dissolution of explosives Dissolution of excess fertilisers
Acids (e.g. sulphuric acid)	Leaching activities (e.g. removal of iron staining) Minerals present within site boundaries (e.g. sulphides)
Ammonia-based reagents	Dissolution of explosives
Process chemicals	Processing plant On-site laboratory wastes
Soaps/detergents	Staff washing facilities
Flocculants/treatment chemicals	Water treatment plant
Other contaminants	
"Heat"	Non-contact cooling water Quench and other coolant waters

O' Faircheallaigh's (1991) broad overview of the minerals industry considers the nature of large-scale metals mining impacts under three main headings: economic, biophysical and social. As he stresses, these impacts rarely occur in isolation and usually affect and interact with one another. Nevertheless, much of the literature to date relating to large-scale mining impacts has concentrated on economic or biophysical impacts to the neglect of social impacts. Although the accumulation of knowledge is the raison d'être

of social science, social science has given little attention to the social impacts of many major social system interventions, including mining. Newbury's (cit. Connell & Howitt 1992) literature review of half a century's mining in the Pacific Islands exemplifies this. It concludes:

> '*We are left, on the whole, with some very general accounts by servants of the companies concerned, export statistics and congratulatory assurances that the effects of half a century of experiments in wage labour have been for the general good*'.

The relative paucity of social literature in this field is of some concern given the significance of mining social impacts, their connectivity to economic and biophysical impacts, and the effort spent on predicting them (Boothroyd 1995). Nevertheless, a number of key mining related processes resulting in subsequent social impacts can be discerned. Connell and Howitt (1992), Young (1995) collectively identify these processes as: the displacement of people from their land; the alienation of people from their traditional livelihoods; the influx of outsiders; the degradation and pollution of land, air and water resources; the generation of new revenue and investments and; the introduction of negative social practices and cultural decay. The social impacts connected to these and other mining related processes are examined in Table 2.7.

The social impacts summarised in Table 2.7 are complex and a function of location, timing, specific resource and the nature and strength of the pre-existing social system. Nevertheless, many of social impacts are in no way unique to particular mining projects and have often been recurrently experienced and documented. In addition to exhibiting generic or unique aspects, the social impacts stemming from mine developments may also exhibit positive or negative aspects. Indeed, the literature suggests that mining is an ambivalent phenomenon, presenting, on the one hand, opportunities for the production of substantial wealth, and on the other hand, social breakdown.

Table 2.7. Summary of the social impacts of large-scale mining and potential causes

Social Impact	Potential Cause	References
Socio-Health		
STD including AIDS	Prostitution can become rife in areas where it had been rare or non-existent, because of lack of alternative employment options for women. Commentators also document the problem of illegitimate children from sexual liaisons between migrant mine workers and local women, rarely in receipt of subsequent financial or paternal support.	Tsinoung *et al.* 1989 Canterbury 1997 Hyndman 1992 Howitt 1989b
Stress, Hypertension, Depression.	The vibration effects of mine blasting can result in the structural degradation of buildings, while the noise effects of mine blasting can have an adverse impact on the mental and physical health, interfering with human activities such as sleep, speech and hearing. It can also induce stress-related illnesses such as hypertension and depression.	Tsidzi and Adofo 1995
Eye and Respiratory Infection	The generation of excessive atmospheric particulates or dust from activities such as soil stripping and dumping, heap leach crushing, blasting, open pit drilling, ripping and haulage all act as particulate generators. Atmospheric dust caused by mining activities like these raise the incidence of respiratory infections such as tuberculosis in mining communities.	SGS 1996a.
Digestion and Gastric Disorders	The release of mine oxides is linked to the generation of acid rain. In some areas this has created acid lakes and a drastic decline in fish stocks due to the ability of acids to leach aluminium to surface waters. Trees and crops may also be affected by acid rain due to the leaching of key nutrients impacting then on human health and nutrition.	Franklin 1998
Liver Failure, Delirium, Skin Infection.	Chemical solutions such as cyanide, mercury and arsenic to extract soluble ore are often left untreated either in pools or allowed to seep into the groundwater, posing a particular health risk. Exposure to high levels of mercury, cyanide and arsenic can be fatal or result in disorders e.g. conjunctivitis, delirium, dermatitis, blindness, and liver failure.	Parker 1996
Malaria	In tropical regions alterations by mining to hydrological environment can significantly increase the risk of malaria. The excavations and tailings ponds associated with mining create stagnant waters that can become breeding grounds for malaria carrying mosquitoes.	Sawyer 1992
Depression	Following mining activity land is often denuded by ugly high profile waste dumps and excavations, and stripped of its vegetation. Unless these effects are mitigated through re-vegetation and landscaping the aesthetic appeal of an area can be much reduced.	Wilson 1982
Accidents, Violent Assault, Kidney, Liver & Nervous Disorder, Depression.	The Ranger Uranium Enquiry foreshadowed drug and alcohol abuse as most serious incremental impact of mining. Excessive drinking rarely characterises whole communities, but the minority involved can disproportionately impact other community members with associated problems of domestic violence and accidents.	Fox *et al.* 1977 Kesteven 1984

Table 2.7 (cont.)

Social Impact	Potential Cause	References
Socio-Cultural		
Loss of Community Identity and Cohesion.	Displacement from land by new or existing patterns of mineral ownership through land seizures and clearances can impact on the social and cultural fabric of the indigenous community. Land often serves as a place of habitation, a medium of social exchange, a focus of cultural and spiritual belief and a sign of status for communities.	Emberson-Bain 1994 Ross 1990 Rickson et al 1995
Loss of Social Control and Order.	Population increases caused by a large and diverse migratory population seeking employment can lead to housing shortages, inflationary pressures, income disparities and consolidation of cash economy. The contrast between newcomers and entrenched population can also destroy existing informal mechanisms of social control.	Freudenburg 1980 Wright 1997 Macfarlane 1999a
Increased levels of Crime, Delinquency, Suicide, Sexual Abuse.	Cumulative impacts of major resource developments like mining are associated with the 'boomtown' scenario, characterised by increased levels of crime and violence, drug and alcohol abuse, stress, community instability, depression, school drop-out, juvenile delinquency, welfare caseloads, drunkenness, suicide, and child abuse.	Boothroyd et al 1995 Kohrs 1974
Urbanisation and Dissolution of Existing Cultural Norms.	In the longer-term mining causes both subtle and explicit cultural changes. The influx of migrant, often western mine workers, can lead to the dissolution of existing traditional cultures and the emulation of western culture among indigenous community members resulting in rapid rural-urban migration with its attendant social impacts.	Hyndman 1992 Renner 1997
Accidents and Crime.	Other cumulative impacts associated with mining activities include a marked rise in crime. This has been specifically attributed to the mining's displacement of traditional livelihoods and exposure to migrant material goods. Generally elevated levels of fatal and non-fatal accidents result from increased vehicle movements in and around mine.	Avotri 1997 Seyditz et al. 1999
Socio-Economic		
Unrealistic Expectations, Entitlement Conflict, Inequality.	Compensation for the use of the land and damage done to it can significantly contribute to livelihoods of recipients, but can be misused and create expectations that may be difficult to fulfill. Impacts can also stem from inequitable payments, conflict over entitlement and distribution of compensation to landlords rather than tenants.	Robinson 1992 Howitt 1992 O'Faircheallaigh 1984
Loss of Productive Land	Relocation refers to the provision of land and property for community members at a more distant place. Relocation maintains social cohesion and minimises disruption to other aspects of community life but is also potentially fraught with its own problems including the provision of unpromising replacement land for agricultural communities.	Kamara 1997:25 Bhandari 1994
Increased National Revenue	Mining can provide a significant source of national revenue through profit related royalty payments and fixed taxation. Mine developments can also potentially benefit the local economy through the payment of local taxes and government royalties if they are fed back through localised minerals development and investment funds.	Waelde 1992. Macfarlane 1999a

Table 2.7 (cont.)

Social Impact	Potential Cause	References
Material and Consumption Gains.	Mining investment and mining services have enabled many mining communities to extend the range and quantity of items they consume. Diets, in particular, have often been greatly transformed, in some areas contributing to improved nutrition, in others a growing dependence on imported foods has led to a growth in non-communicable diseases.	Ulijaszek 1987. O'Faircheallaigh 1991
Lost Investment Potential	Potential impact of mining investment and revenue generation is not fulfilled. Improved infrastructure, make it easier for mining projects to import and process nearer markets, reducing the incentive to promote domestic linkages. Bulk of new mining investment not in non-metallic ores that have higher domestic linkages.	Abugre and Akabzaa 1998 Jauch 1996 ECA (UN) (1997)
Infrastructure, Housing, Training, Health and Education Improvements.	Increasingly, mining companies have been at the forefront of corporate / community initiatives and partnerships for social development. Many are now directly facilitating and financially supporting community infrastructure development, house building, institution building and development, agricultural methods training, health and education.	Davis 1997b
Socio-Livelihood		
Loss of Sustainable Livelihoods	Displacement from land by new or existing patterns of mineral ownership through land seizures and clearances can alienate existing communities from their traditional livelihoods like farming, hunting and artisanal mining. These activities can be large employers and sources of sustainable livelihoods for the existing community member.	Aubynn 1997
Direct Employment	Mining's employment generation is well expounded. Major mining projects can employ upward of 20000 workers at project inception. With appropriate training local people may gain employment at mine, but for many this is exception rather than the rule - most of the employment benefits are not localised.	Redwood 1997 Quodling 1991 Boothroyd et al 1995
Conflict, Dependency and Unemployment	Unemployment at closure is made particularly problematic because of lack of transferable skills and miner's typical psychological profile. In isolated mining areas closure impacts whole community as it has been the focus of livelihood dependency, and tensions and divisions between migrant workers and the indigenous community become exacerbated.	Kieselbach 1987 Mckee and Bell 1986 Neil et al 1992
Indirect and Secondary Employment.	While the potential for direct or localised employment at mining projects is decreasing with increased mechanisation, the potential for localised, secondary or 'spin off' employment remains high. In the gold mining industry this is generally calculated on the basis of the ratio 10 indirect job to every 1direct job.	Radetski 1994 Young 1995
Dependency and Unemployment	The impact of mine closure on people in 'spin-off' employment will vary according to the degree to which the local economy has become dependent or integrated with mining. Mine communities that have evolved over many generations (where diversification opportunities are limited) are likely to experience most severe social problems at closure.	Neil and Brealey 1982 Eikeland 1992
Loss of Sustainable Livelihoods	Clearing and exploration of mining areas threaten ecological integrity and natural habitats. In particular, by removing its protective cover, deforestation has left land exposed to heavy rains causing extensive soil erosion & loss of soil fertility.	Marcus 1997 Mondal et al 1994 Ayensu 1997

Key Existing Programmes and Good Practices

Table 2.8. Key Existing Programmes and Good Practices

Type	Description	Status
Policy	Every mining country has its own regulations and policies on medium and large-scale mining. In general these will concern requirements for, for example, environmental and social impact assessments, rehabilitation plans and compensation plans. At the international level, mining companies will make reference to the policies of the World Bank and other international financing institution as these usually exceed national requirements. They tend to have policies in a number of environmental and social areas affected by major developments like mining. Below are some examples covering the common large-scale mining issue of resettlement: • World Bank (2001) Operational Policy (OP4.012) • World Bank (1991) Operational Directive (OP4.30) • World Bank (1993) Resettlement Review. • World Bank Operations Manual 2.33.	Active
Programme	*Abandoned Mine Waste Working Group*: The U.S. Federal Advisory Committee to Develop On-Site Innovative Technologies created the Abandoned Mine Waste Working Group to address specifically the barriers to the development, deployment and commercialisation of innovative technologies to remediate abandoned mine waste. Part of the Group's conclusions was that technology development should be market-driven based on the needs of those involved in the clean-up. In this way, the scientific and non-scientific site specific requirements are met by allowing a flexible response in terms of local site conditions, desired level of remediation, cost and so on. To facilitate this, a *lead organisation* existing as a partnership between public and private bodies is required. This organisation would clarify the technology requirements in mine waste remediation, develop a priority list for technological solutions and develop and promote a mechanism for technology transfer. Although this conclusion was developed in a U.S. context, the concept is sound and broadly applicable to scenarios in developed and developing countries alike.	Low activity
Programme	*The Acid Drainage Technology Initiative* (ADTI): Initiated in 1995 by federal agencies, the National Mining Association and the Interstate Mining Compact Commission to identify, evaluate and develop cost-effective and practical acid drainage technologies. The National Mine Land Reclamation Center was selected, initially, to provide secretariat, project management and research services. In 1999, ADTI was expanded, through the addition of the metal mining sector group, which began organization efforts in 1998. ADTI now addresses drainage quality issues related to metal mining and related metallurgical operations as well as acid drainage from coalmines, for future and active mines as well as for abandoned mines. ADTI recognizes the distinction between technology development and its implementation in the regulatory process. ADTI is a technology development program. It is not a regulatory or policy development programme.	Low activity

Table 2.8. Key Existing Programmes and Good Practices (cont.)

Type	Description	Status
Programme	*Australian Mineral Industries Research Association* (AMIRA): Within its wider remit to develop and manage collaboratively funded research programmes and projects in the minerals sector, AMIRA has also been involved with the management of two projects related to acid rock drainage: ▪ Mine Waste Management: Prediction and Kinetic Control of Acid Mine Drainage ▪ Management of Sulphidic Mine Wastes These projects are managed on behalf of sponsoring companies, and are based on the outputs of an earlier project (Mine Waste Management: Prediction of Acid Generation in Waste Rock and Process Tailings).	Projects due to complete soon – possible extension and further projects.
Programme	*International Council on Mining and Metals* (ICMM): The ICMM adopted the following Sustainable Development Charter, which was first developed and accepted by its predecessor organisation, ICME: "The production and availability of a broad range of metals is essential to modern life. Throughout human history, social and economic progress has been dependent to a large extent on the availability and use of metals. Assured supplies of metals will be required to meet the needs of the world's growing population and to help fulfil expectations of improvement in the quality of life, notably in developing countries. Given their unique physical and chemical properties, metals are essential for a number of uses in transportation, housing, power generation and transmission, and electronics, as well as for a wide range of high technology applications in the telecommunications, computer, aerospace, medical and environmental control industries. Metals can also be reused and recycled indefinitely without loss of their properties. Exploration, extraction and primary metal processing activities create wealth and enable ICMM members to meet society's requirements for metals while contributing to sustainable development and enhancing shareholder value. Approached in a responsible manner, such activities will help alleviate poverty, particularly in remote areas, and foster sustainable improvements in the health, education, prosperity and the standard of living of communities. Thus, mining and metal production can serve as catalysts for regional economic and social development. Some ICMM members are also in a position to contribute to biodiversity conservation and the conservation of ecological and cultural values in protected areas adjacent to their operations. The commitment of ICMM members to recycling also provides important opportunities to extend the use of these materials, conserve resources, reduce energy usage, minimise waste disposal and contribute to the needs of future generations. ICMM members accept the importance of responsible management of their operations from discovery to closure. They are able to contribute to the scientific knowledge on the safe production, use and disposal of metals. They are also committed to adopting appropriate measures and to implementing enhanced risk management strategies, based on sound science, valid data, effective public consultation and understanding of community cultures and needs, in order to minimise adverse environmental and community impacts. Neither their operations nor their products should present unacceptable risks to employees, communities, customers, the general public or the environment.	Active

Table 2.8 (cont'd). Key Existing Programmes and Good Practices

Type	Description	Status
	(ICMM cont.) The rapid liberalisation of trade and investment, the revolution in information technology, and the need to respond to changing social values and expectations are influencing the way responsible companies conduct business. As a consequence, ICMM members recognise the benefits of integrating environmental, social and economic aspects into their decision-making processes. It is also acknowledged that consultation and participation are integral to balancing the interests of local communities and other affected organisations and to achieving common objectives. From the perspective of ICMM members, society's pursuit of sustainable development is a dynamic process that will continue to evolve over time in response to changing social values and priorities. Sustainable development involves values and principles that guide the corporate policies and practices that enable ICMM members to contribute to economic, social and environmental progress as well as to institutional and technological advances"	
Programme	*Mining Metals and Sustainable Development* (MMSD): Initiated by the World Business Council for Sustainable Development (WBCSD), is an independent process of participatory analysis aimed at "*identifying how mining and minerals can best contribute to the global transition to sustainable development*." MMSD is a two-year project designed to produce concrete results during this period, and to create structures capable of being carried forward thereafter. The WBCSD is a coalition of 150 international companies united by a shared commitment to sustainable development via the three pillars of economic growth, ecological balance and social progress.	Draft Final Report released in 3/02
Programme	MiMi (*Mitigation of Environmental Impact of Mining Waste*) is a programme financed by the Swedish Foundation for Strategic Environmental Research and focuses on improved, economically efficient mine waste management.	Active
Programme	*Mine Environment Neutral Drainage* (2000) MEND 2000 was a three-year program that officially started January 1998. The Mining Association of Canada (MAC) and Natural Resources Canada funded the program equally. The key to MEND 2000 was technology transfer, providing state-of-the-art information and technology developments to users via workshops, reports and online services. Long-term, field scale and other key projects initiated under MEND were also being pursued. Through these efforts a further reduction of the environmental liability associated with acidic drainage will be realised. The MEND 2000 objectives were: • Transferring the knowledge gained from MEND and other related acidic drainage projects; • Verifying and reporting the results of MEND developed technologies by long-term monitoring of large-scale field tests; • Maintaining a link between Canadian industry and government agencies for information exchange and consensus building; and • Maintaining linkages with a number of foreign government and industry driven programs.	Inactive

Type	Description	Status
Programme	The *International Network for Acid Prevention* (INAP) is an industry based initiative that aims to globally co-ordinate research and development into the management of sulphide mine wastes. The main objectives of INAP are to promote improvements in the management of sulphidic mine materials and reduction in liability associated with acid drainage, through research and the development of technology. To meet these objectives INAP will: • Achieve a significant reduction in the liability associated with mine materials through information sharing, collaborative research and implementation of best management practices through the complete mining business cycle. • Build credibility with key stakeholders through their engagement in the affairs of INAP and the collaborative development of a worldwide guide based on best management and technical practices as applied to acid prevention and control • Establish an organisation with demonstrated structure and abilities to make long-term improvements in acid prevention and other environmental issues on the basis of global co-operation and action	Active, but relatively inaccessible outside member companies
Programme	US Department of the Interior's (USDI) *Abandoned Mine Lands Programme*. Working with the US Geological Survey, the US Forest Service, the US Environmental Protection Agency and western state governments, the USDI has undertaken work to identify and prioritise sites on Bureau of Land Management, National Park Service and US Forest Service administered lands. The primary focus is the clean up of abandoned and inactive mine sites	Active
Programme	*The Global Mining Initiative* (GMI) brings together many of the world's largest mining and minerals companies. This leadership exercise aims to ensure that an industry that is essential to the well being of a changing world is responsive to global needs and challenges. The Initiative will include a number of activities leading up to a global conference on mining and sustainable development in May 2002. This conference will be a significant contribution to the events that will mark the 10th anniversary of the Rio Earth Summit. The objective is to reach a clearer definition and understanding of the positive part the mining and minerals industry can play in making the transition to sustainable patterns of economic development. The companies most closely involved in the initiative are members of the Mining and Minerals Working Group of the World Business Council for Sustainable Development (WBSCD)	Active – major conference in Toronto, May 2002
Practice	*Community Development Schemes*. Western mining implemented a particularly noteworthy scheme at their Tampakan mine in the Philippines. The community development practices implemented as a result of this scheme include: • Infrastructure development - improved road access and housing, the construction of medical clinics, schools and community centres; • Sustainable agricultural methods - assistance in improving technologies for subsistence farming, livestock upgrading, and agro-forestry; • Health initiatives – the delivery of on-site medical care, community health education, waste management, and provision of water / sanitation services; • Education initiatives - the provision of primary education, adult functional literacy programs, and local/indigenous employment and training programs.	Inactive

Type	Description	Status
Practice	*Environmental and social impact assessments* (E/SIAs). These are generally carried out as a policy requirement, although many larger companies are carrying out E/SIAs that are more extensive than regulatory requirements demand to assist them in planning and to assist subsequent and ongoing social and environmental monitoring and management. There are many examples of them in the mining industry, however, a most innovative one was a participatory E/SIA carried out in Australia by Dale and Lane (1995)	Inactive
Practice	*Monitoring and Management*. Once an assessment has been conducted, inexpensive ongoing participatory monitoring on behalf of the community and the company will facilitate the iterative identification of deviations from the proposed actions; evaluation of changing needs; unanticipated impacts; and potential impacts through to when closure or downsizing are eventually realised. This is an essential precursor to the next stage of advanced planning which, suggests Wolfe (1992) would involve the drawing up of a contract between the employees, community and the mine company. Manitoba mine in Canada fulfilled many elements of this contract which was characterised by: • Establishing a specific fund, served perhaps by royalty payments, to tackle the future problems including decommissioning. • Stating the company policy towards management and closure with regard to notice, moving costs, severance payments, retraining and related issues. • Including an undertaking to develop with the community at the earliest stage (given that there is typically up to a seven-year lead in the establishment of new ventures) alternative sources of economic productivity. • Developing an appropriate recruitment policy	Inactive
Practice	*Diversification*. Between 1981 and 1985, six of the seven mines of Tennant Creek, in Australia's Northern Territory closed. However, while employment in mining fell by 64%, total employment fell by only just over 30%, allowing Tennant Creek to survive as a functional community. The reason for this was a concurrent expansion in the tourist and food processing industry and a continued commitment to maintain the town as a regional service centre. In this way government programmes helped support the public sector that in turn supported employment in the private sector service industries (Becker, 1997).	Inactive
Practice	*Partnership and consultation*. At Placer Dome's South Deep mine in South Africa, the company has initiated a programme of tri-sector partnership between themselves, the mineworkers and community, and the local, regional and national government. This partnership was established to jointly manage the company's massive retrenchment programme of workers following downsizing. They, like an increasing number of companies, established community engagement committees, consisting of key community representatives that are consulted on an ongoing basis during mine development and operation.	Active

Summary of Key Points

Background

- The vast majority of silver production is traded as a homogenous product, based on large-scale mining, and in the hands of a relatively small number of producers.
- End-users of silver therefore have relative advantages and disadvantages in trying to trace the source of the silver and implement ethics along the supply chain.
- Over three-quarters of all silver output is driven by, and produced as a primary by-product of, lead/zinc, gold and copper mine extraction and processing.

Key Issues

- Mining waste management, contamination of groundwater, acid rock drainage, pollution from accessory metals, remediation management.
- The legacy of large-scale mining operations prior to greater environmental and social regulation continues to represent a burden to both the society and industry.
- Community dependency and mine closure has led mining companies to look at innovative ways to capacity build rather than 'maintain' communities.
- Voluntary and involuntary resettlement and relocation of communities by mine operations has most significant negative ramifications for community members.
- Metal mining is a significant source of local employment in otherwise remote and underdeveloped regions and provides critical tax revenue for many countries.

Social and Environmental Impacts

- The environmental impacts of silver mining are usually negative and significantly influenced by the nature of the mining process and regulatory environment.
- The social impacts of metal mining are positive and negative, more generic and always effect local health, culture, economics and livelihoods.
- Metal mining environmental impacts and their management are inextricably linked to potential impacts on human health and wellbeing.
- The most serious social impacts of metal mining are often the least tangibly connected, this includes cumulative impacts like mental illness and alcoholism.

Existing and Recommended Policies, Programmes and Practices

- Responsible policies exist in all mining economies, however, companies tend to adhere to stringent world bank requirements because of need to secure finance.
- Advanced telecommunications and stakeholder pressure have been drivers to the creation of a wide range of mining industry initiatives, standards and benchmarks.
- In this new risk conscious investment climate, these initiatives are being translated into innovative and responsible practices on the ground.

3. Processing Gems and Metals and Jewellery Manufacture

Introduction and Background

In this chapter we discuss the steps involved in processing the raw materials for jewellery. We focus in particular on gem processing (cutting and polishing), the production of jewellery and the trading involved between these steps. Whilst some countries and companies focus on one stage in the production process, in many cases the distinction between gem and metal processing and production of jewellery can be artificial, as can be seen in Thailand where different branches of the same firm may be involved in each stage. Because of the paucity of material and the close inter-connections between production process, firms and traders, we have adopted a case study approach to the presentation of issues rather than the thematic approach adopted in earlier chapters.

Very few studies on the trading of gems, outside the conflict diamond issue, have been found. In this section we have tried to identify key issues at this point in the supply chain by focusing on three country case studies (Sri Lanka, Thailand and India) preceded by a discussion of issues in the diamond value chain. The material here has been culled largely from trade news, Internet sites and the business pages of newspapers as a result of web searches. The country cases presented here have been selected on the basis of information availability, importance to global trade in gemstones and jewellery and the extent of employment in the industry.

The market for gemstones has been described as 'woolly' on account of its 'notoriously fragmented supply base' and 'the unregulated nature of the industry' (Bailey 2002a). While accurate figures for the size of the market are very difficult to determine, a figure of $10billion per annum has been cited by HSBC (Bailey 2002a). The industry is extremely complex, involving many thousands of businesses involved at different stages. The industry is characterised by geographic clusters of firms within which firms are inter-linked through trading relations and layers of sub-contracting, often bound together through ethnic and family ties, or association links built up over long periods of trading (Scott 1994). Scott (1994: 25) describes the trading networks as 'transaction intensive' as both stones and finished items may change hands several times even in a single country before they are traded across borders.

There are close links between the various processing centres, held together by traders, in often-impenetrable networks bound by secrecy. UK importers and wholesalers for example are reluctant to divulge their suppliers, as this is a key component of their commercial assets. Security and the maintenance of confidence in business relations are also important because of the high value of the raw materials and products involved and the ease with which they can be smuggled. A variety of formal and informal mechanisms are used to ensure trust, as are described by Scott (1994) in his comparison of the jewellery clusters in Bangkok and Los Angeles and Westwood's (2000) analysis of Indian diamond traders.

What sometimes appears to be an archaic and traditional industry is increasingly affected by globalisation as long-established patterns of trade and production are slowly changing. Only a small number of very high value diamonds are now cut and polished

in the traditional diamond cutting hubs of New York, Tel Aviv or Johannesburg. Most small and lower priced diamonds are now processed in factories or small-scale artisanal workshops near Mumbai as well as Suratin and Navsari in India (however about a hundred countries are involved in exporting and / or cutting and polishing diamonds including Thailand and China, Global Witness 2002: 34). Joint ventures are emerging in Thailand in the diamond trade, as we see below.

Despite the complexity of the industry, we can identify three basic stages in jewellery production: (i) cutting and polishing of gems, (ii) finishing of metals and (iii) setting and final preparation of the jewellery. These stages are 'concatenated with one another' (Scott 1994: 250) and there are frequently overlaps between manufacture and wholesale. We have found some material providing characterisations of traders and trading networks, but this tends to be at a general level. We have found a gap in the literature covering particular traders or trade routes of particular items. There are many places in the supply chain of gems and jewellery where the picture is more than a little hazy and requires some close primary research.

Relatively little information has been found on social and environmental impacts and issues in the processing and jewellery industry beyond concerns about child labour which have been the focus of campaigns led by the International Federation of Chemical, Energy, Mine and General Workers' Union (ICEM)[3] and the International Labour Organisation (ILO). Most of the studies and news reports have centred on economic development of the industry, with a focus on the promotion of exports. This is part of the supply chain where research is particularly needed.

The diamond supply chain

The diamond industry is formalised and consolidated. For many people the story of the diamond supply chain is the story of De Beers. The company has mining operations and is involved in downstream activities such as branding and end-consumer marketing initiatives where the largest margins are available, see Table 3.1. There are of course other players, as can be seen from the discussion below. Nevertheless, the dominant role played by De Beers in shaping the market is implicit at every stage, though the veil of secrecy that shrouds some relationships means that it is difficult to pinpoint quite who is involved where.

De Beers is at the apex of the diamond trade, a powerful position that it maintains through tight control over the sale of rough diamonds and increasingly through generic marketing of diamonds and marketing services offered to the high-class end of the jewellery market. It is also an incredibly wealthy company with inter-governmental links.

[3] The ICEM hosted a workshop in late 2001 on child labour in the gem processing industry, at which the union and ILO committed to following up the issue in 2003. No further information beyond the commitment to work for the elimination of child labour in the sector has been found on their website (ICEM 2001).

Table 3.1 Margins and value added in diamonds

Value of rough diamonds sold at mine gate	$7.3 billion
Diamonds sorted and polished sold to jewellers	$14 billion
Value added in jewellery making (including labour and cost of other materials – precious metal, other stones)	$28 billion
Retail, 100% margin (mostly profit)	$56 billion

Source: Goreux (2001), citing Mining Journal 1999.

For most observers of the diamond trade, the hot topic is 'conflict diamonds', see Box 3.1 for definitions. The origin of the concept is in the links made between illegally traded diamonds and funding for rebel groups in war-torn countries such as Angola, Sierra Leone and the Democratic Republic of the Congo (DRC) in the 1990s. Initial measures to stem the trade included embargoes by the UN Security Council. For example, in the wake of the failure of peace accords in Angola, in 1992 the Security Council placed embargoes on arms imports and diamond exports from Angola and established a sanctions committee. The 1997 military coup in Sierra Leone and collapse of the 1999 Lomé peace agreement in May 2000, led to similar sanctions (Goreux 2001). A number of NGOs such as Global Witness and Partnership Africa Canada (PAC) investigated and initiated campaigns on the issue, coining the phrase 'conflict diamonds' from around 1998. The profile and momentum of the campaign led to the international community and the industry recognising that more effective measures were required.

Certain characteristics of diamonds and the method of mining in these areas helped them fuel conflict in countries such as DRC, Angola and Sierra Leone. Diamonds are found in alluvial deposits in remote areas, some of which are mined using rudimentary techniques by largely unregulated artisan miners who have very few livelihood opportunities. Miners may sell to whomever they can and their operations are not secure and are vulnerable to attack and theft. Some mining in conflict areas has been actually controlled by rebel groups, particularly by UNITA in Angola (Hart 2002). The high value and small size of diamonds means they are easily smuggled. It is difficult to trace the exact origins of a diamond, so trade in conflict diamonds is very difficult to police, offering many avenues for rebels to engage in this lucrative trade.

Six stages of the diamond supply chain, with particular reference to the roles played by De Beers, the largest producer, and India, the largest processing country, are described below:

a) Mining

As we noted in chapter 1, globally, 40% of diamonds by value are from De Beers mines, based mainly in southern Africa (De Beers website) and 34% of diamonds by value come from Russia, Australia and Canada. About 24% of remaining world production comes from ten countries of West and Central Africa and the remaining 1.6% from Latin America and Asia (Goreux 2001). West and Central African diamonds are alluvial diamonds predominantly extracted by ASM using much simpler technology.

Box 3.1 Definitions of conflict diamonds

The Kimberley Process defines conflict diamonds as 'rough diamonds used by rebel movements or their allies to finance conflict aimed at undermining legitimate governments'. Reference is made to relevant United Nations General Assembly and Security Council Resolutions in various documents produced by the Kimberley Process and the World Diamond Council.

Interestingly, Global Witness points out that the UN has provided at least three differing definitions of conflict diamonds, one similar to the KP definition (UNGA resolution 2000) but others extend the definition to include 'the illicit traffic in and proliferation of armaments, especially small arms and light weapons' (UNGA 2002) and 'the fuelling of armed conflicts that affect international peace and security' (UN Security Council 2003) (all cited by Global Witness 2003: 7).

Action Aid argues that the Kimberley Process definition is too limited as it only covers diamonds traded by rebels or their allies and argues that a more 'accurate' definition would cover diamonds that are 'used to fuel conflict (whether by rebels or existing governments) and promote systematic human rights abuses' (Action Aid 2002: 1).

Amnesty International (2002) highlight the human rights abuses involving unnecessary use of violence in apparent defence of their mines by state-run mining operations and provides many examples of 'extra-juridical executions' and serious 'gunshot injuries' that have occurred on mining concessions of MIBA, the mining company partly owned by the DRC government, with minority shareholding also held by De Beers and Umicore. Moreover, it is noted that part-owners De Beers have committed to responsible business principles which include clauses on avoiding trading in diamonds where it causes human suffering. Questions are therefore raised by Amnesty as to how these commitments are implemented beyond conflict diamonds, as it is evident that human rights abuses within the diamond industry, and indeed illegality, are not confined to diamonds traded by rebel groups.

More controversially perhaps, Smillie's analysis of illicit diamond trade, which he argues can be as much as 20% of world trade in diamonds, 'created the opportunity and space for conflict diamonds, and regardless of how current conflicts unfold, it will continue to present a threat to peace and stability in Africa'. There is therefore, he argues, a need to monitor and quash illegal diamond trading as 'Conflict diamonds are a major human security problem and illicit diamonds are their spawning ground' (Smillie 2002: 1).

b) Purchase of rough gemstones

The DTC, i.e. De Beers, purchases between 60 and 70% of rough diamond output (Goreux 2001, Hart 2002)[4]. De Beers holds ten sales or 'sights' per year in London, Lucerne and Johannesburg (De Beers website) at which their diamonds are sold to its clients or 'sightholders'. According to De Beers, their approximately 120 clients comprise 'the most experienced diamond polishers and dealers in the world"; "who are 'world leading diamantaires', and are carefully chosen for their diamond and marketing expertise" (De Beers website). De Beers' clients are well established in the trade and are required to demonstrate that they are financially secure (Westwood 2000: 869), which is important because traditionally diamonds are traded for cash. Sight holders are invited by De Beers; there is no formal application process to become part of this elite group (Hart 2002). Sight holders are offered diamonds that meet the DTC's assessment of the

[4] Goreux states that DTC buys 70%, whereas Hart claims that only 60% of the world's rough are purchased by DTC, but he notes that it used to buy as much as 80%.

quality and quantity requirements of the sightholder (the offer also depends on an assessment of the company's assets, and is likely to include stones that the sightholder may not want); there is no negotiation on price (ibid). However, whilst the sight holders have obligations to De Beers, they are also able to buy on the open market in Antwerp and Tel Aviv, often at prices up to 30% cheaper than De Beers (Bailey 2002).

Another other main dealer in rough diamonds is Argyle, a company partly owned by Rio Tinto and Ashton Mining Ltd, that split from what was then the Central Selling Organisation in 1996 to market its own diamonds. Argyle's diamonds are primarily industrial and lower priced gems, but also include very expensive 'pink' diamonds (ILO 1997:7). Argyle trades primarily through Antwerp. Most Canadian diamonds, which were discovered as recently as the 1990s, are not sold through the DTC (Hart 2002).

Despite the tight grip of the large diamond houses on the trade, much of the trade in diamonds is actually illicit, perhaps as much as 20% of world trade (Smillie 2002:1). Hart's (2002) history of the diamond gives vivid accounts of how they are stolen at different points along the chain, for example by miners (on the sole of shoes, using homing pigeons, in the guts of workers) and sorters (who calculate what can be pocketed on the basis of rounding down declared weights). Then there is smuggling of diamonds across borders to evade tariffs and border controls, which existed long before the issue of conflict diamonds arose, which we discuss below. For many years there appeared to be a tacit acceptance that the recorded provenance of many diamonds did not tell their whole story and may be concealing illicit trade. Smillie (2002) notes that Belgian trade figures are unreliable in terms of recording the origin of diamonds – they are recorded as coming from places where there are no diamond deposits (e.g. Gambia) and may well be diamonds that originally come from conflict sources. Diamond exports from Liberia were thirty times what the country could physically produce (Goreux 2001: 10); questions are therefore raised about their origin.

c) Sorting in Diamond Centres

The main centres are New York, London, Antwerp, Lucerne, Tel Aviv, Johannesburg, Mumbai, and Dubai where diamonds are sorted according to size and quality before being sold to manufacturers;

In the region of 80% of rough and 50% of polished diamonds pass through Antwerp (Goreux 2001). As stones may pass through trading centres many times in exchanges between dealers, it is very difficult to assess trade patterns; a task made even more difficult by the fact that Belgium is the only country that issues data on diamonds imports and exports. Goreux (2001) notes that the annual import volumes into Belgium are usually twice the amount of world production in a single year.

Gem and jewellery exports from India have experienced dramatic growth over the last four decades, from 1% of Indian exports in 1960 to 17% in 1994/5, and are one of the country's largest export earners (ILO 1997: 5). Exports of coloured gemstones account for approximately 3% of exports (1994-5) (ILO 1997: 11). These go primarily to the USA (29%), followed by Hong Kong, Belgium and Japan (ILO 1997: 11). India's main competitors are Switzerland, Israel and Hong Kong (ibid). We discuss the Indian gem industry in more detail below.

However, most diamonds supplied to the Indian processing industry come from Argyle and are of relatively low quality (ILO 1997: 7). Indeed, the low cost and high-turnover of polished diamonds from the Indian industry has meant that low carat diamonds previously considered worthless have now entered the market (Hart 2002). Another source is the Hindustan Trading Company, which controls 5% of the diamonds (Westwood, 2000: 861) and there is also an illicit trade, including diamonds from Russia (ILO 1997: 8).

The Indian sightholders have until fairly recently held a tight control over the industry, bound by links of honour and trust. At the 'pinnacle of the Indian diamond business there are approximately thirty Indian De Beers sightholders who buy from De Beers in London, many of whom are part of tightly knit Jain family firms from Palinpur 'interconnected through kinship'' (Westwood 2000: 859). But there are new entrants into the Indian diamond trade, largely Gujeratis from Saurashtra (ibid: 866). The trade is centred around Mumbai and more recently Surat.

e) Cutting and polishing

The four main centres of diamond cutting are Antwerp, New York, Ramat Gan and Mumbai. In addition diamonds are cut in Thailand, Sri Lanka, China and Russia. The location of these activities depends on skills and labour costs. Very few, and only very high value, diamonds are now cut and polished in New York, Tel Aviv or Johannesburg; most small and lower priced diamonds are processed near Mumbai. In 2000, India accounted for 50% of the global business in polished diamonds by value and 80% by volume (Hart 2002: 223). Global Witness (2002: 34) suggests that about a hundred countries are involved in exporting and/ or cutting and polishing diamonds.

d) Jewellery manufacture

De Beers is not directly involved in the production of jewellery but is much more involved in marketing. The jewellery manufacturing industry is fragmented in much the same way as gem processing. Some of the Indian firms that are sight holders have diversified into jewellery making and export jewellery around the world (Westwood 2000: 867).

e) Marketing

The traditional strategy of De Beers was horizontal integration (Goreux 2001) and strict control of the entry of diamonds, thus inflating the price, and controlling a buffer stock. In the late 1990s, holding a large buffer stock proved costly for De Beers and the stability of the market had encouraged other large players to explore and exploit diamonds (in Canada and Australia in particular). The dominant position of De Beers was therefore threatened and in 1998 a new strategy was introduced of a more vertically integrated system, linking the kimberlite mines to the jewellery sold under the De Beers name. The aim of the CSO/DTC is now to be the "supplier of choice to the industry" which led to significant business re-organisation both to maintain profits and defend its reputation as a dealer in ethical diamonds.

De Beers is being more proactive in the marketing of diamond jewellery. The DTC offers services to the sightholders so that they can identify opportunities in the market place and distribute their diamonds more efficiently. The company has promoted diamonds generically since 1939, but is now putting more effort into this activity; according to their website, in 2003 they will spend approximately $180 million

promoting diamond jewellery in 18 languages and in 16 countries around the world. "Supplier of Choice" is the Diamond Trading Company's sales and marketing strategy, which aims to drive consumer demand for diamond jewellery; supported by bespoke consumer and marketing research. DTC is focusing on creating a strong brand identity, supplemented by a new icon – 'the Forevermark' with which they aim to promote the company's integrity. The DTC website also links this icon to adherence with the company's Best Practice Principles. Another strand to De Beer's marketing is to team up with luxury goods brand companies such as France's LVMH (Louis Vuitton Moet Hennessy) (Goreux 2001 citing the Financial Times 16/01/01).

The diamond supply chain is unusual in the degree of control of a very small number of mine operators, but it appears similar to the supply chain for other gemstones in terms of the complicated networks and the number of deals made along the supply chain.

Sri Lanka Gem and Jewellery Industry

Sri Lanka is the source of many thousands of gemstones on the international market and as we have seen earlier, gemstone mining is an important activity for the livelihoods in the country. A number of precious and semi-precious stones including sapphire, ruby, and topaz are mined in Sri Lanka, largely in the Ratnapura area. Cutting and polishing of gemstones, and to a lesser extent the production of gemstone jewellery also takes place in Sri Lanka (see Table 3.2). The export of finished gemstones, reliant on cheap but relatively well-educated labour, has been a prime contributor to the country's economic growth, accounting for approximately 10% of merchandise exports. There has been particularly rapid growth in the volume of processed gemstones exported since 1990 (WTO 1995).

Table 3.2 Sri Lanka gem & jewellery exports

	1999		2000		2001	
	US$m	%	US$m	%	US$ m	%
unpolished gems	2	1.184834	2.5	1.145213	2.3	1.406728
Jewellery	8.8	5.21327	10.8	4.94732	17.2	10.51988
polished gems	39	23.10427	61	27.9432	56	34.25076
polished diamonds	119	70.49763	144	65.96427	88	53.82263
Total	168.8	100	218.3	100	163.5	100

Source: KIASIA 2002 citing National Gem and Jewellery Authority

The industry from mining through manufacturing to retail in local and overseas markets is overseen by the government's National Gem and Jewellery Authority (NGJA) formerly the State Gem Corporation (SGC) established in 1971. Its aims include prevention of smuggling and assisting the gem industry by skills development and promotion of exports. It also regulates gem mining through the issuing of permits and licences. The NGJA issues five categories of license: mining, lapidary, dealing, gem auctions and gem land auctions. The number of licenses for each activity awarded between 1986 and 1991 are set out in Table 3.3. Due to complexities in licensing, this table is likely to under-estimate the number of economic units operating in the industry, especially in mining, jewellery manufacturing and gem trading, as not all are licensed.

Table 3.3 Licenses awarded by NGJA				
Year	**Mining**	**Dealing**	**Lapidary**	**Auctions**
1986	4625	1586	50	1064
1987	6497	1846	208	1323
1988	6733	1723	162	1069
1989	6401	1563	160	952
1990	7198	2470	284	999
1991	5226	2585	331	903

Source: Henney 2000

Table 3.4 below, indicates that there are at least 50,000 employees in cutting and trading of gems and in jewellery manufacture.

Table 3.4 Employment in the Sri Lanka gem and jewellery industry			
	Employed		
	Officially	Unofficially	Total
Gem mining	85,000	20,000	105,000
Gem cutting (incl diamonds)	20,000	….	20,000
Gem dealers	3,200	5,000	8,2000
Heat treatment	200	….	200
Jewellery manufacturing	18,000	5,000	23,000
Gemmologists	350	…	350

Source: KIASIA 2002 citing National Gem and Jewellery Authority

Cutting and processing of gemstones

Gemstones for processing in Sri Lanka are sourced from local traders and imported through foreign dealers. Henney reports that gem miners face a number of restrictions in selling their product including acquiring appropriate licenses and trading cartels: 'marketing is traditionally very hierarchical and structured, with gem miners selling their stones to local dealers who in turn trade on material to larger regional dealers and companies who then sell to the major players in Kandy and Colombo' (Henney 2000).

Henney (2000) also reports that in the Ratnapura district, a number of Gem Miners' co-operative societies have been established to facilitate gem trading. In order to assist cutting and polishing (lapidary) and jewellery manufacture, the NGJA has set up training centres. Lapidaries are based in Colombo, Eheliyagoda, Naula and Ratnapura with jewellery centres in Colombo and Belideniya.

There are many small to medium scale gem dealers and traders in Sri Lanka, but the industry is dominated by several large companies which can export in bulk. An example of one of the largest gem companies in Sri Lanka, provided by Henney (2000), is ZAM Gems Ltd based in Kandy. It buys 'rough and cut gems from a succession of small and medium scale dealers, gem cutters and auction houses and processes and markets these products to customers, particularly those in the overseas export market'. Another role played by the larger gem dealers is to place 'subcontracts with local Sri Lankan gem cutters, often to cut and polish imported stones' (Henney 2000).

A series of interventions led by USAID have tried to modernise the industry and explore opportunities for increasing the value added from the industry: many gems leave the country polished but not incorporated into jewellery. There have typically been trade links from the Sri Lanka gem industry to the Thai jewellery industry, though the volume of exports to Thailand fell in the late 1980s, when the Thai economy was suffering from the South East Asian crash. The key market for Sri Lankan gems is Japan, as can be seen from Table 3.5 below. Other important markets are the USA, with Germany and Switzerland the main European consumers. The Middle East does not appear in official statistics, though this has been cited by several dealers as a major export market in personal interviews undertaken by Henney (2000).

Table 3.5 Exports of Gems sold through the NGJA

Country	**1988** (Rs.M)	**1989** (Rs.M)	**1990** (Rs.M)	**1991** (Rs.M)
France	1.5	7.1	7.0	4.9
Germany	16.4	81.3	131.9	77.5
Hong Kong	83.5	120.0	146.0	67.2
Indonesia	8.9	7.1	93.6	45.9
Japan	845.4	779.2	999.5	1039.7
Singapore	23.9	26.9	53.5	73.5
Switzerland	93.8	45.2	39.2	21.6
Thailand	87.8	44.8	44.6	33.6
U.K.	11.9	10.1	13.4	3.5
U.S.A.	126.2	149.6	192.9	110.9

Source: Henney (2000) citing Airyaratna (1993)

Jewellery manufacture

There are over 20,000 workers employed in jewellery manufacture, as indicated by table 3.4 above, but the product is of low value relative to the high value of stones mined in Sri Lanka. Production is low-technology and workers tend to have low levels of skills. Figures on exports (see Table 3.2. above) indicate that the value of polished gems exported, greatly exceeds the value of jewellery exports, though the value of jewellery exports has doubled from 1999 to 2001.

Whilst the jewellery industry has been relatively successful to date, efforts are being made to build on this success and modernise the industry and increase the value added retained in the country by building up the jewellery production industry. The jewellery industry in Sri Lanka has been characterised by a large number of small, informal companies scattered at different points along the supply chain. The chain is weakly integrated with a fragmented supply base. Most of the stones processed are imported rather than sourced domestically, partly because of the reduction and then elimination of import tariffs on uncut gemstones in the 1990s. The WTO notes that there are considerable opportunities for greater domestic sourcing of the industry (WTO 1995).

Since 1997, the Sri Lanka jewellery industry has undergone a number of reviews and a developed a strategy to increase value added, to create closer links in the value chain and to reposition the Sri Lanka industry in the international market through product differentiation and branding. (KIASIA 2002).

Challenges identified by the reviews:

- Opportunities for high value jewellery manufacture and increased value added not taken up
- Limited international marketing beyond participation in the Tucson Arizona gem and jewellery fair
- Lack of gemmological laboratory to authenticate gems
- Only informal linkages between firms; industry characterised by scattered production units

(KIASIA 2002, Explore Sri Lanka 1997)

In developing recommendations for the industry, consultants have looked to the Thai jewellery industry, the destination of many of Sri Lanka's polished gems, which is spatially clustered (see Scott 1994, discussed below), with close links between firms and an effective trade association (KIASIA 2002). They also plan to emulate Thailand's 'Gemopolis' (see below). This would build on the services already offered by the NGJA in collaboration with the private sector, the Sri Lanka Gem and Jewellery Exchange (SGJE). Its main function is to facilitate the exchanges between gem dealers and arrange export under one roof, where there is also the SGJE Export Section, Assay Office and Gem Testing Unit (Henney 2000).

The NGJA is working closely with the American donors to develop and implement a strategy to foster the improvement of the industry. The strategy includes establishment of:

- An industrial gem and jewellery zone where gem-cutting and jewellery manufacturing units can be established, ideally in a free trade zone;
- An information, exhibition and marketing centre, a gem and jewellery data bank and a gem and jewellery exchange counter;
- A chain of institutions specializing in different areas like gem-cutting, heat-treating, polishing and marketing;
- A modern gem-testing laboratory, able to issue certificates of authenticity and quality (Explore Sri Lanka 1997, Daily News 2002).

Since the beginning of the project, growth in exports to the USA, the country's main buyer of gems, has been reported. Gem and jewellery exports to the USA totalled Rs.873.59 million in 1999 and were 1631.42 million in 2000 (Daily News 2002). The United States has over 30% of the total exports of gems and jewellery from the country with Japan and Hong Kong having a market share of 13% and 14% respectively (Daily News 2002).

Interestingly, in view of the US interest in ethical issues in the jewellery supply chain, reports on the sector development project reviewed to date did not refer to labour standards in the industry (beyond noting its reliance on the informal sector and the aim to increase the skill base in the sector). We have not found any data on working conditions in Sri Lankan gem processing, though information on labour conditions in other sectors, fragmentation of the industry, the dominance of informal sector firms and use of subcontracting suggest that conditions are unlikely to be good.

The Gem and Jewellery industry in Thailand

The gems and jewellery industry has only developed over the past 30 years, but has emerged as one of the world's leading exporters of gems and jewellery, though there is a long history of gem mining. The industry was in 1998 the country's sixth-largest export earner. Thailand also imports gems; in 1997 86% by value were diamonds (from the United States, Israel, Ghana and the Congo) (Business in Thailand 1998). Approximately 600,000 people are employed in the gem and jewellery industry, meaning that it is a major employer (Business in Thailand 1998).

The gem and jewellery industry in Thailand has interest for this current study beyond the lessons that Sri Lanka strategists seek to emulate. We discuss trade and exports, the structure of the industry, and then working conditions.

Gem and jewellery trade

The jewellery industry as a whole expanded considerably in the 1990s, following a surge in the 1970s. Between 1980 and 1990 the value of exports grew six fold (Scott 1994: 255, citing the Department of Export Promotion in Bangkok) and between 1993 and 1997 exports grew by 30% (DTI 2000: 132). The collapse of the baht in the late 1990s led to some decline, especially in the home market, but the expansion of exports, especially to the USA, has contributed to recovery (DTI 2000: 132). In 1999-2000 the export value recorded a 6.3 percent increase from the previous year, or US$ 1,675 million, compared with the reduction of 7.1 percent during 1995-1998 (Bank of Thailand 2001).

Trade liberalisation measures have facilitated activity in diamonds and gold. The abolition of import and export duties on diamonds in 1991, has meant that the country is becoming a centre where gem stones from around the world are shipped to be processed. In 1998 it was cited as the world's fifth largest diamond cutting and polishing centre (Business in Thailand 1998). The diamond cutting sector is dominated by joint-ventures where foreign investors supply lapidary equipment and technology and the rough diamonds to be cut in Thailand (Business in Thailand 1998). In the early 2000's, Belgian firms increased their presence in the Thai diamond cutting sector (Bank of Thailand 2001).

Similarly, VAT on gold bullion imports was removed in September 2000. Many foreign manufacturers have set up in Thailand thanks to the favourable tax environment and incentives, for example, exporters are exempted from, or have reduced import duties and value-added tax on raw materials.

The import of silver, the metal from which much of Thai jewellery is made, as of 2002 is still taxed, which means that much of the silver trade (up to a third) is conducted on a cash, off the records basis (Silver Institute 2002: 67-8). Similarly many finished products and exports are also traded on a cash basis (ibid).

Thailand is moving to the production of higher value silver pieces of jewellery compared with the past and is beginning to challenge Italy for its position in the production of silver jewellery and silverware (Silver Institute 2002). Thailand sells about 40% of its silver jewellery to the USA, and also sells to the UK, France, Germany and Italy. Another major market is Japan. Altogether, approximately one third of production is exported.

Despite positive movements in the export market, the Bank of Thailand (2001) noted an overall trade deficit in the gem and jewellery sector in 2000 largely on account of gold imports.

The industry in Thailand
Gem processing units tend to be clustered in the Chanthaburi district (KIASIA 2002) and around 200 jewellery firms are based in two contiguous districts in the heart of Bangkok (Chinatown and along the Surawong-Silom Road). However there are also some large factories in special industrial districts such as the 'Gemopolis' (Scott 1994: 256/7), described as a 'fully integrated one-stop service which is a jewellery manufacturing and exporting centre developed and operated by a group of leading gem and jewellery enterprises' (Daily News 2002). There are about 100 jewellery factories outside Bangkok. Most factories are relatively small and labour intensive, though there are a few large factories, of which twenty are considered to be 'major gem and jewellery manufacturers' (Business in Thailand 1998).

The growth and export success of the industry has been credited to the efforts of the main industry association, the Thai Gem and Jewellery Traders Association (TGJTA) (Scott 1994, DTI 2000). The TGJTA 'engages aggressively in efforts to create political advantages for the industry and promote international markets' notes Scott (1994: 256). The integrating role played by the association in a typically disparate industry, was highlighted by the DTI report, which suggested that the many British trade associations should learn from its success.

The TGTA has around 500 members (DTI 2000: 133). There are however, other associations including the Thai Diamond Manufacturers Association and Thai Jewellery Association (TJA) with 24 and 500 members respectively (ibid). Scott notes that most of the owner-managers of firms in the TGTA and TJA are ethnically Chinese, but their workers are usually indigenous Thai (1994: 259).

The industry is bound together by tight networks of interlocking ownership; firms extend over a variety of sub-sectors with 'different firms each run by a family member who holds shares in every other firm in the network' (Scott 1994: 259). Scott's analysis implies that there is little room for outsiders and tight networks bound by familial links make traceability and transparency to the outsider difficult. Customers must earn 'preferred buyer' status over a long period (Scott 1994: 260).

Working conditions in the Thai gem and jewellery industry
There appears to be little data on working conditions in the Thai gem or jewellery industry. Where we have found reference to working conditions, analysis has been partial and not the main the focus of the piece (e.g. brief reference to health and safety and the workplace environment or commentary on the extent of child labour.)

Nevertheless, it is clear that the industry is labour-intensive and is based on low cost labour (ILO 1997: 15), notwithstanding concern in the country that the Thai industry is losing business to even lower cost suppliers such as China (Global March, no date). In Scott's survey of Bangkok jewellery firms, 54.9% of workers were female, mostly recruited from rural areas (1994: 258). He also found poor working environments in

most of the factories and units visited, citing dust and fumes as major problems (the survey did not go into detail on health and safety or labour rights) (ibid).

An ILO study noted that in general, working conditions were poor (ILO 1997: 15). Scott regarded the fact that most staff had been employed for three years or more a positive feature (ibid). The Thai industry, led by TGJTA and government, are taking measures to improve the skill level of the workforce with a view to making inroads to more quality and design oriented markets (Scott 1994: 260). Trade unions have begun to organise in the industry, but the prevalence of subcontracting means that many workers are difficult to organise (ILO 1997: 14).

Child labour is a feature of many South East Asian labour intensive industries; anecdotal evidence suggests that the incidence of child labour in the Thai gem industry has declined since government took decisive measures on the problem in 1991 (ILO 1997: 15), or perhaps more likely, because some production has transferred to cheaper producing countries such as China (Global March, mid 1990s).

The gem and jewellery industry in India

India is the world's largest gemstone and diamond processing centre. In 2001, India earned US $ 7.78 billion from gems and jewellery, which accounted for 17.55% of total exports (Thapanachai 2002). India accounts for 95% of the world's diamond cutters and polishers, and respectively supplying 95%, 85% and 65% of processed and exported emeralds; rubies, sapphires (Westwood 2000). India is also significant in the production of silver jewellery. India is the largest manufacturer of silver for jewellery, followed by Italy which is increasingly facing competition from Thailand and China. China has a larger but less skilled labour force than Thailand (Silver Institute 2002). In 2002, 38.4% of silver jewellery and silverware came from the Indian subcontinent, 26.4% from Europe, 9.5% from North America, 4% from the Middle East, 16.1% from East Asia (ibid). The growth in the Indian gem and jewellery industry is demonstrated in Table 3.6 and Table 3.7 presents the major export destinations of Indian gems and jewellery.

We have referred to the role of India in relation to diamonds earlier in this chapter. Here we discuss briefly gem cutting and processing and jewellery manufacture.

Gemstone processing is concentrated in Jaipur. The work predominantly takes place in home-based workshops and other informal locations often within the family, but also through employees who do not enjoy permanent employee rights under the law. Many workers in the industry are migrants, either permanent or seasonal. A village study conducted in the semi-arid areas of Gujarat observed that 30 per cent of the labour in the village migrated to small towns or cities and were employed in non-farm activities, the majority of them in diamond polishing polishing (Rani and Dodia 2000, citing Shylendra et al 2000).

The informal nature of the industry is underlined by the fact that no labour laws specifically cover the gem industry (ILO 1997:11). Children account for around 10% of workers, which in Jaipur amounts to 20,000 children (ibid. 12). Children work the same hours as the adults but, because they are considered apprentices, earn significantly less. Over half of the child workers come from impoverished families with few livelihood opportunities whose parents see no alternatives for them, as they cannot afford school (ibid.13).

In some cases, companies operate a number of sites with divided ownership in order to avoid registration since the law exempts firms employing more than ten workers (ILO 1997 8). Workers are inducted into the business through apprenticeship lasting from six months to three years, during which time training wages are paid (ILO 1997: 8). The labour force consists largely of young women, especially for the lower skilled tasks and many operations also have child workers, with estimates of children accounting for between 3% of the total workforce around Mumbai to 25% around Surat (ILO 1997: 10).

Summary and Key issues

There is relatively little literature on traders in the gem and jewellery industry or on how the component parts of jewellery pieces are sourced. Exceptions include the studies on gold and diamond supply chains by Hartwick (1998) and Westwood (2000) and the description of the networks in the jewellery cluster of Bangkok by Scott (1994). The former is more concerned with the symbolism within consumption and political connections between producers and consumers than analysis of links in the chain. Westwood is also in this symbolic school, being concerned with understanding constructions of masculinity in the 'romance' of the trade, but provides more depth on the business relations in the secretive world of diamond trading. Scott's study begins to get to the character of the industry and the trading links, but does not cover any specific commodity chains or businesses.

The literature covered in this section, particularly in relation to Thailand highlights the important role played by industry associations from the point of view of economic development of the industry and co-ordinating export promotion. In such a fragmented industry, the leadership of a central representative organisation can be important. Industry associations are likely to be pivotal to the introduction of any ethical initiatives in the sector in relation to gathering support and ensuring that local understanding is embedded into the initiative.

Exporting is critical to the success or failure of the jewellery industries in the countries highlighted. The US is the major market in most cases (in 2002, the U.S. market for unset gem-quality diamonds was estimated to be more than $10.5 billion, accounting for at least one-third of world demand, US Geological Survey 2003***).*** The collapse of consumer confidence in the US market following the 11th September 2001 terrorist attacks has had severe consequences in some gem and jewellery producing countries. Up to 200,000 Thai gem and jewellery workers have lost their jobs for instance (BBC 2002).

- Processing and manufacturing are fragmented: there are many small companies bound together in intricate trading relationships
- In more successful producing countries, a single industry association plays a central role in maintaining competitiveness
- Industry associations are likely to be pivotal to the introduction of any ethical initiatives in the sector in relation to gathering support and ensuring that local understanding is embedded into the initiative

Table 3.6: India's exports of Gems and Jewellery, 1996-7 to 2001-2												
	96-97		**97-98**		**98-99**		**99-00**		**00-01**		**01-02**	
	Rs. Million	US$ Million	Rs. Million	US$ Million	Rs. Million	US$ Million	Rs. Million	US$ Million	Rs. Million	US$ Million	Rs. Million	US$ Million
Cut & Polished Diamonds	149165	4235.1	165794.5	4492.66	210741.2	5026.11	287065.1		280418.1	6186.7	283464.9	5971.91
Coloured Gemstones	4812.5	136.94	4931.2	132.81	7468.7	178.63	8849.7	204.92	9242	203.36	8665.1	182.69
Gold Jewellery	26362.1	747.73	30969.4	839.48	35417	846.15	46937.4	1087.37	52200.6	1149.95	55381.4	1166.83
Pearls	131.2	3.74	146.3	3.92	163.3	3.91	172.3	4.01	116.6	2.58	125.9	2.63
Non-Gold Jewellery	1030.2	29.36	1292.2	34.88	2427	57.79	2096.9	48.58	2548.8	56.09	3048.6	64.34
Synthetic Stones	87.7	2.5	86.7	2.34	102.6	2.41	114.3	2.62	73.8	1.63	113.9	2.4
Costume/Fashion Jewellery	205.2	5.78	223.8	6.08	220.9	5.28	256.5	5.96	438.1	9.65	482.8	10.21
Sales to Foreign Tourist	286	8.12	492.5	13.45	440.4	10.54	387.3	8.98	558.1	12.34	612.9	12.94
TOTAL	182079.9	5169.27	203936.6	5525.62	256981.1	6130.82	345879.5	8010.26	345596.1	7622.3	351895.5	7413.95
Exports of Rough Diamonds	3134.9	88.78	1799.1	48.6	3402.1	80.84	5818.5	134.76	7131	157.19	6730.1	142.15
Net Exports	185214.8	5258.05	205735.7	5574.22	260383.2	6211.66	351698	8145.02	352727.1	7779.49	358625.6	7556.1

Source: The Gem and Jewellery Export Promotion Council (2003)

Table 3.7 Destination of Indian Exports of Gems and Jewellery

Country	97-98		98-99		99-00		00-01	
	Rs. million	US$ Million	Rs. million	US$ Million	Rs. million	US$ Million	Rs. million	US$ Million
Belgium	81294.5	2188.35	100817.5	2388.28	137726	3167.75	115586.4	2535.68
UK	21658.3	587.31	27850.6	658.01	42755.5	983.57	51427.3	1130.27
Israel	6923.9	187.09	8787.5	207.89	18000.8	414.04	14168.5	310.37
UAE	8.7	0.23	910.7	21.32	2140.2	49.33	7677.3	167.81
Hong Kong	1207	33.12	5060.5	118.62	12690.9	292.03	14807	323.18
USA	389.6	10.33	410.2	9.77	616.9	14.18	799.5	17.55
Switzerland	1962.2	53.94	727.4	17.38	918.5	21.14	543.4	12.25
Thailand	25	0.69	0.7	0.02	83.2	1.94	40.1	0.9
Others	874.1	23.69	116.3	2.73	134.1	3.08	411.1	8.98
Gross Imports	114340	3084.75	144681.4	3424.02	215066.2	4947.06	205460.6	4506.99
Exports of Rough Diamonds	1799.1	48.6	3402.1	80.84	5818.5	134.76	7131	157.19
Net Imports	112540.9	3036.15	141279.3	3343.18	209247.7	4812.3	198329.6	4349.8

Notes:
Above data for 1999-00 & 1998-99 include countrywise breakup from SEEPZ, Mumbai and data of C & P Dia (Bonded W H). Others for 97-98 include exports from SEEPZ, Mumbai as countrywise breakup from SEEPZ is not available for 1997-98.

Source: The Gem and Jewellery Export Promotion Council (2003)

4. Jewellery retail and the consumer market

Introduction

We have separated wholesale distribution and retail from the production process for simplicity of presentation and because we have concentrated largely on the UK jewellery market. Jewellery for the UK market is increasingly imported and so for many pieces of jewellery there is a large geographic separation between retail and production, though many wholesalers maintain close contact with at least some of their overseas suppliers. The close integration of manufacture and retail is seen as important for business success especially where innovative jewellery designers are trained and employed within the industry (DTI 2000: 125, citing India). However, for many UK retailers, their relationship with manufacturers and suppliers is at arm's length.

In this chapter we briefly consider the global markets for precious metal and gemstone jewellery and then move the focus to the UK. We discuss the UK jewellery industry considering industry bodies and manufacture and retail of jewellery in the UK and begin to discuss the nature of supply chain. The remainder of the chapter discusses best practice in the jewellery industry, considering measures adopted by UK and US bodies to address social and environmental ethical issues in the supply chain, including the conflict diamond issue.

Consumer markets for precious metal and gemstone jewellery

The largest export market in the world for jewellery is the USA. For most of the 20th century (1900 to 1975) 50% of gem-quality diamonds by weight and value were imported by the US; from 1970s to 1999 it fluctuated between 40-67% by weight and 28-48% by retail value. Only Japan comes close to the USA in terms of consumption of gem-quality diamonds (Levinson and Cook 2001). Purchases in the USA also account for 50% of the world's gemstones (BBC 2002). However in terms of total demand for jewellery, India is the largest consumer of gold jewellery, according to data supplied by the World Gold Council (see Table 4.1.)

In the UK 90% of jewellery pieces sold are made from gold (DTI 2000: 9), so the World Gold Council figures are a likely to be a reliable proxy for trends in the volume of gold jewellery demanded in the UK.

Globally demand for gold jewellery is on a downward trend due to economic recession and the effects of the 11th September 2001 terrorist attacks on consumer confidence. Demand in Europe has slipped, particularly in Germany. Nevertheless demand appears buoyant in the USA (contrary to reports in relation to gem exports to the USA from Thailand noted by the BBC 2002).

Table 4.1 Demand for gold Jewellery (tonnes) 1997-2002

Country	1997	1998	1999	2000	2001	2002
India	572.0	658.2	629.7	620.0	614.7	490.2
Pakistan	73.1	52.8	64.0	54.1	47.0	48.1
Greater China	485.8	345.3	306.1	280.9	265.7	236.7
• China	339.0	243.3	215.3	205.6	203.2	199.6
• Hong Kong	58.3	29.1	25.2	22.8	21.5	18.2
• Taiwan	88.5	72.9	65.6	52.5	41.0	18.9
Japan	71.9	53.9	51.9	49.8	50.6	46.5
S Korea	94.1	39.0	55.7	61.8	63.5	60.7
SE Asia	182.7	101.1	199.5	195.5	206.0	194.9
• Indonesia	91.0	41.5	109.8	86.7	97.8	92.9
• Thailand	33.1	14.9	42.5	56.3	53.3	46.8
• Vietnam	17.5	16.0	18.3	21.0	23.8	24.7
• Malaysia	20.6	16.5	18.6	19.8	19.4	19.3
• Singapore	20.5	12.2	10.03	11.7	11.7	11.2
Middle East	**455.7**	**445.6**	**445.9**	**448.2**	**429.3**	**358.0**
• **Saudi Arabia**	**226.6**	**186.8**	**168.7**	**169.8**	**163.4**	**139.3**
• **Egypt**	**131.9**	**134.8**	**137.6**	**128.1**	**115.9**	**82.0**
• **Gulf States**	**97.2**	**124.0**	**139.6**	**150.3**	**150.0**	**136.7**
-UAE	37.9	62.9	80.8	94.3	94.9	88.3
-Kuwait	32.6	32.2	29.6	28.5	27.1	23.1
-Bahrain	14.1	14.8	13.5	12.3	12.7	11.9
-Oman	5.7	8.0	8.1	7.8	8.0	7.5
-Qatar	6.9	6.1	7.6	7.4	7.3	6.0
Turkey	**149.6**	**139.6**	**91.9**	**147.7**	**92.4**	**97.9**
Americas	**407.2**	**445.7**	**465.2**	**493.1**	**483.2**	**469.3**
• USA	316.5	349.8	373.9	387.3	389.3	388.0
• Mexico	33.2	38.1	48.6	57.8	53.7	47.8
• Brasil	57.5	57.8	42.7	48.0	40.2	33.5
Europe	**271.1**	**281.7**	**272.0**	**264.7**	**265.3**	**248.1**
• Italy	113.1	112.4	100.7	92.1	91.7	87.6
• UK	54.2	63.7	65.0	75.0	81.9	77.6
• France	49.8	56.1	57.4	54.0	52.4	48.3
• Germany	54.0	49.5	48.9	43.6	39.3	34.6
World*	**3311.0**	**3181.5**	**3151.0**	**3186.6**	**3064.0**	**2726.7**

*Including non-specified countries.
Source: World Gold Council (2003). Figures may not sum to totals due to rounding.

The Jewellery Industry in the UK

Whilst the UK is the home of some of the leading jewellery firms and associations[5] the UK is not a major producer of jewellery, indeed it is the subject of a government programme to improve its competitiveness (DTI 2000). Jewellery retail is steadily growing, at almost 5% per annum in the late 1990s, but this has been largely on the basis of 'wider availability of low priced imported jewellery, though there has been a growth in UK jewellery manufacturing (DTI 200: 8,9). Nevertheless, the capture of just over half of the UK market for jewellery and the fact that only 5% of UK production is exported, is regarded as sub-optimal by industry specialists commissioned by the DTI.

We can distinguish between four sub-sectors in the industry, each with a representative body:

Sub-sector	**Organisation**
Jewellery retailers	British Jewellers' Association
Costume jewellery wholesalers and importers	Jewellery Distributors' Association
Jewellery manufacturers	National Association of Goldsmiths
Gemmologists	The Gem Testing Laboratory of Great Britain & GAGTL Gem Testing Laboratory

A criticism of the 2000 DTI report was that the different parts of the industry were not in dialogue with each other. However, initiatives to deal with the conflict diamonds issue, and the initiatives overseen by the DTI to re-invigorate the industry have led to a lot more cross-industry dialogue and bodies such as the BJA and NAG are co-operating on a number of initiatives.

We will focus here on precious jewellery manufacture and retail, though making some reference to the costume jewellery sector.

Jewellery Manufacture

There are approximately 1500 jewellery manufacturers in the UK, employing in the region of 8,300 full time and 1,800 part-time staff; there are another 1,300 full time and 200 part-time staff involved in the production of costume jewellery (DTI 2000: 12, 13). The manufacturers of precious jewellery can be split into three groups (DTI 2000: 13; 21):

a) Twenty companies with a turnover of more than £5 million, averaging £8 million; the largest has a turn-over in the region of £70 million, just over a third of which is produced in the UK
b) Approximately 150 companies with a turnover averaging £1million
c) The remaining 1400 companies with less than 10 employees and a turnover averaging £100,000.

This categorisation reveals the extent to which manufacture is based on small companies, some of which are 'designer makers' which may be linked to a small retail business. The DTI study regards the polarisation as detrimental to the competitiveness of the industry due to the dearth of 'top decile' business managers and lack of a growth

[5] The World Gold Council and The Diamond Trading Company are cited on the CIBJO website as UK-based members; they are respectively a global industry body and a private company.

culture (DTI 2000: 12). Further, there is perceived to be inadequate attention paid to generating or understanding consumer demand, a lack of integration between designer-makers and the industry at large and an adversarial relationship between producers and retailers, which we discuss in more detail below (ibid). Some observers have noted how the designers of the art school generation have introduced an element of innovation, the like of which the very traditional British jewellery scene has not seen before. However, the issue in terms of the DTI competitiveness study is that this skill is concentrated in niche markets, sometimes unaccompanied by business acumen and unavailable to the more industrial part of the sector, which would benefit from a greater design input.

UK manufacturers have traditionally been clustered in three geographic regions: Central London (specifically Hatton Garden), Sheffield and Birmingham. However the value added from firms outside the three clusters now outweighs that from the traditional centres.

UK jewellery retail

The retail market for jewellery in the UK is expanding (see Table 4.2), partly reflecting increased incomes, but also reflecting the availability of cheaper imports.

Table 4.2 UK Retail Sales of Jewellery

	Sales £million	% increase
1995	1694	-
1996	1767	4.3
1997	1855	5.0
1998	1955	5.4
1999	2055	5.1

Source: DTI 2000:8, citing Office of National Statistics

The structure of the UK retail market is indicated in Table 4.3. The jewellery retail sector has been characterised as 'highly conservative' (DTI 2000: 122). It is dominated in terms of market share and shop numbers by the Signet group, which has two main chains of outlet (H Samuel – mass market and Ernest Jones, upper end of high street).[6] In addition to these national high street chains, there are number of other players in the market including department stores and home-shopping TV channel QVC, value (i.e. discount) retail chains, clothing stores (especially for especially costume jewellery e.g. Accessorize) and independent jewellers. Mintel (2001) notes that there 'are very few jewellery chains in the UK with over 50 branches'. Most chains are regional. There are also a significant number of up-market independent jewellery retailers. A key trend amongst these retailers is to focus more on design.

Thus the industry has tended to become polarised with intense competition within the 'the low-priced part of the market as budget-style retail chains like Warren James and Half Price Jewellers continue to grow, providing stronger competition for Argos, H Samuel and Index' , while 'upscale retailers' distance themselves from this sector, by emphasising quality, branding and service (Mintel 2001). Branding through the use of logos and visible identifiers has been important for products such as watches, but for obvious reasons is less viable for items of jewellery. Nevertheless, more intangible

[6] In the US, Signet operates 999 stores under the K Jewellers, Jared - The Galleria of Jewellery as well as other regional names. In the UK there are 605 stores under the H Samuel, Ernest Jones and Leslie Davis fascia. There are 428 H Samuel stores and 177 Ernest Jones stores in the UK.

aspects of branding including provenance and guaranteed quality are becoming more important.

Table 4.3. Retail shares of the jewellery and watch market, by type of outlet, 1999 and 2001

		1999			2001	
	Precious jewellery	Costume jewellery	Watches	Precious jewellery	Costume jewellery	Watches
Multiple jewellers	43	14	27	42	14	27
Independent jewellers	25	5	16	25	5	16
Catalogue showrooms	10	15	26	12	16	28
Department stores	6	49	8	7	49	8
Mail order*	5	8	8	5	7	7
Other**	11	9	15	9	9	14
Total	**100**	**100**	**100**	**100**	**100**	**100**

* includes Internet retailing and other home shopping
** includes network marketing and other shops
Source: Mintel (2001)

Traditionally the UK jewellery retail sector has been supplied by a large number of disparate suppliers. The supplier-retailer relationship has traditionally been short term and based on price; retailers have tended to pick and choose between large numbers of potential suppliers in a hierarchical relationship where the retailer dominates (DTI 2000: 24). Major retailers may have 30-40 core suppliers and up to 200 occasional suppliers. Even single outlets may have a wide circle of suppliers through the use of buyers' groups as well as direct purchases (ibid).

However, of late there has been some recognition of the need to build new, more collaborative relations between suppliers and retailers and that suppliers need to develop a more detailed knowledge of their customers' client base[7]. Longer term relationships are developing (DTI 2000: 24). Nevertheless the development of category management as has developed in the food and clothing retail sectors appears to be some way off. Mintel (2001) also reports that suppliers in the jewellery market have also been contracting in number as the market has concentrated into the hands of fewer manufacturers and suppliers.

In addition, there has been a tendency for design-led and branded suppliers to look for exclusive retail deals, at least on a geographical basis. This has led to retailers building stronger relationships with fewer suppliers, usually by default rather than by design, but at the same time, retailers do not want to cut the number of suppliers as they wish to ensure a diversity of stock.

[7] An interesting trend remarked by Mintel and much of the industry press is the increasing number of women purchasing jewellery for themselves rather than waiting for men to buy items for them. This has design and customer service implications as men have been characterised as more cautious, conservative shoppers whereas women are more likely to be adventurous with colour (Jewellery in Britain 2003b).

The UK jewellery retail industry has not been particularly proactive in marketing, either in terms of stimulating domestic demand (Mintel 2001), or in promoting exports (DTI 2001). However suppliers are increasingly driving the retailers to collaborate in marketing initiatives.[8:] Jewellery marketing is not about pricing, it is more about reputation, quality of stones and precious metals, workmanship, and the image; De Beers for one, is solicitous about selling the 'romance' of diamonds (Westwood 2000).

The push for closer retailer-supplier relationships is clearer at the top end of the market where suppliers are placing more importance on branding. At the upper ends of the market, more consumers are 'opting for the prestige, design and image of branded goods in jewellery (e.g. Cartier, Gucci)' (Mintel 2001). Some producer companies are protecting their brand by carefully selecting outlets. For example, a newcomer to the diamond trade, Hot Diamonds is restricting distribution to one retailer per town in order to build exclusivity (Mintel 2001). Recent emphasis on design-led companies and branding appears to have resulted from the coming of age of the art-school generation of British jewellers and has dragged the gem and jewellery establishment out of the Victorian era. The steps by De Beers to link up with luxury goods retail groups is also indicative of this trend.[9]

Producers who are brand owners, rather than retailers, tend to take the lead on marketing, especially at the top end of the market. Branding tends to be linked to design, innovation, quality and reputation. Reputation has historically been linked to the authenticity and quality of the gemstones, and the ability to trace legal trading chains. The conflict diamonds issue has placed the spotlight onto the trade and its ability to claim that their product is clean. The components of reputation have become more complex.

This push for branding and associated reputation management is particularly important at the upper ends of the retail market. At the lower ends of the market and in the costume jewellery sector, the retailers appear to have more sway and the supply chain dynamics are different and appear to be more akin to systems that have developed in clothing and food.

Stronger relationships between suppliers and retailers may have positive implications for implementing ethical schemes within the industry, as the potential for closer communication and for sharing of sales and product knowledge could help both players in developing their marketing and future planning.

Ethical practices in the Jewellery industry

Ethical supply chain initiatives in the jewellery sector are dominated by the conflict diamonds issue and the Kimberley Process. This is certainly the key ethical issue, outside of gemmological issues, amongst UK producers and retailers of precious jewellery. Interestingly the costume jewellery sector has been engaged with ethical issues relating to working conditions at the source of supply, largely due to the demands

[8] "I expect to see more collaboration and product development between retailers and suppliers for the future. One of the things that's driven supplier relationships is consolidation" says an industry specialist cited by Mintel (2001).

[9] In January 2003 a De Beers joint venture with Louis Vuitton opened its first London store on Bond Street (rj January 2003).

of leading high street retailers who are one of the major outlets for costume or fashion jewellery.

The US industry is acknowledged as leading the way on ethical issues in the industry. The high profile of the Jewelers Vigilance Committee (which was consulted with regard to a proposed USA Patriot's Act which contains clauses on the potential to use the gem and jewellery trade for money laundering, (see JVC 2003) and the investigations undertaken on behalf of the Jewelers of America (see below) are testimony to this. The JOA is beginning to engage with environmental and social supply chain issues.

Traditionally the ethical issues concerning the jewellery industry have been the traditional parameters of business ethics, particularly truthful representation of the product. Globally, the guardian of issues such as official trade descriptions of stones and permitted treatments is the International Confederation of Jewellery, Silverware, Diamonds and Stones, known by its French acronym CIBJO[10]. Part of its mission is to 'protect consumer confidence in the industry' (CIBJO no date). CIBJO produces three so-called 'blue books[11]' that set out CIBJO rules to which all CIBJO-registered gemmological laboratories must adhere. The registered laboratories issue diamond, gemstone and pearl quality and authenticity reports. Full disclosure of processes such as irradiation, filling and dyeing of stones, as well as approved nomenclature and trade descriptions, are covered in the blue books. Many of the processes related to treatments of stones have health and safety and environmental implications, which are beginning to be considered by the industry at large. Industry bodies are also awakening to the scale of the problem of child labour.

International Initiatives

At present the jewellery industry is involved in two certification schemes with the objective of verifying the source of a stone, thereby ensuring that stones from 'conflict' sources or resulting from money laundering or other illicit trade channels do not find an outlet. The first is the increasingly well-known Kimberley Process Certification Scheme (KPCS) which was borne out of a long process of negotiation involving states and businesses and which has statutory as well as voluntary elements. The second is the Tucson Tanzanite Protocol which has a narrower scope, being largely the result of negotiation between US jewellery manufacturers and distributors and the Tanzanian government. There are similarities between the two and the co-operation that has been in evidence in both cases offers some hope for other kinds of supply chain initiatives.

The Kimberley Process Certification Scheme

The purpose of the Kimberley Process (KPCS) is to establish an international certification scheme for rough diamonds based on agreed standards for certificates of origin and national certification schemes (the latter refers to the schemes run by Angola, Sierra Leone and Guinea enabling the identification of conflict free diamonds from these countries). Following international discussions from 2000 and final agreement on the main points of the scheme in November 2002, the participants committed to implementing the KP Certification Scheme from 1st January 2003. On 5th November 2002, 52 governments ratified the KPCS. The US Congress passed legislation relating to their KPCS commitments on 23 April 2003 following the law passed by the European Union on 13th February 2003.

[10] Confederation International de la Bijouterie, Joaillerie, Orfevrierie des Diamantes, Perles et Pierres.
[11] CIBJO produces a publication on diamonds, gemstones and pearls.

Key elements of the system include:

- Individual shipments of rough diamonds must be sealed in tamper-proof containers accompanied by an official certificate of origin.
- Certificates are forgery-resistant and identify a shipment as being in compliance with the requirements of the certification scheme.
- Participants (national governments and regional organisations such as the European Union) are expected to establish internal controls to eliminate the presence of conflict diamonds from exports and imports of rough diamonds (including the establishment of an authority to monitor trade and to ensure that all diamonds are shipped in tamper-proof resistant containers with appropriate KP certificates).[12]
- Participants are to ensure that no rough diamond shipment is imported from, or exported to a non-participant country.
- There are to be annual plenary meetings of the Kimberley Process participants and observers, the first of which was due to be from 28th to 30th April 2003 in Johannesburg, South Africa.
- NGOs can apply for observer status; unlike many UN bodies they have speaking rights.

(Global Witness 2002: 46; more details can be found here and in World Diamond Council 2002b).

Weaknesses in the Kimberley Process include:

- Flow of diamonds from the mine or field to the first export is considered high risk, but is subject only to recommended controls, not absolute requirements.
- Firms are encouraged, not required, to ensure that there are effective security standards put in place to ensure that 'clean' diamonds are not contaminated with conflict diamonds; the warranty system proposed by the World Diamond Council is voluntary.
- Registration or licensing of buyers, sellers, exporters or couriers is only recommended not required.
- There are no mechanisms to ensure that the in-country controls of Participants are comparable or whether Participants have the capacity to enforce the recommended measures.
- No measures for regular independent monitoring of the system, only a peer-review mechanism where complaints against a Participant can be made through the Chair, and any review can only take place with the consent of the accused Participant.
- Information on the trade and process is not centralised; there is no agreement on how to handle statistical data and there is no secretariat to administer the scheme; there is no agreement on gathering or sharing of information between Participants, only various recommendations.
- In the event of non-compliance, there are no specified measures to be taken against a Participant.

(Global Witness 2002: 17; 47-48; Global Witness 2003:2).

[12] In India for example, the Gem and Jewellery Export Promotion Council (GJEPC), a non profit organization overseen by industry and government representatives, has been named as the official import-export authority for the Kimberley Process.

The lack of a monitoring system remains a bone of contention for NGOs who have been involved in the KPCS negotiations. Smillie (2002) on behalf of PAC has undertaken a detailed analysis of several intergovernmental systems as well as private sector voluntary/ self-regulation systems aimed at regulating commodity trade, preventing illegal transactions and/or promoting sustainability, with a view to identifying key features of systems that have worked. He notes that inter-governmental agreements such as KPCS typically have a 'notorious lack of teeth' and that 'Monitoring and inspection through voluntary peer reviews may be helpful for those eager to comply, but are usually ineffective for those countries with no interest in compliance' (2002:3). NGOs involved in and closely following the KP, expressed their disappointment and concern at the lack of a "system for regular, independent monitoring of all national diamond control systems", which is necessary to "ensure that the process is not subject to abuse" (Open letter by alliance of NGOs).[13]

These concerns were re-stated in a press release by Global Witness on 18th April 2003: "The KPCS requires the diamond trade to implement self-regulatory measures to combat conflict diamonds, however, to date the trade has failed to develop and implement any credible measures. The KPCS urgently needs to be strengthened to include independent monitoring." NGOs recognise that there are other flaws in the system, but at present public campaigns are not being undertaken in order to allow the KPCS to 'bed down'. However there is a concern that if monitoring is not taken seriously at next KPCS meeting planned for October 2003, the chance for the system to become effective may have been lost. Recent steps to identify, and demote to applicant status, current KPCS Participant countries that have not yet set in place appropriate legislation to implement the certification system, suggest that the need for monitoring may be recognised more widely (GDO circular July 2003).

The KPCS only deals with rough diamonds. Once diamonds are polished and are in the country of final point of sale, the industry has implemented a self-regulatory system of warranties overseen by the World Diamond Council (see Annex 3).[14] The WDC aims for the system to complement the KPCS. At present this system is voluntary and to date there are no monitoring mechanisms.[15] Moreover, concerns have been raised about the extent to which actors at the end of the supply chain, especially jewellery retailers, are aware of the system of warranties or even of the extent of conflict diamonds in the supply chain (Action Aid 2002). The World Diamond Council's resolution (2002a) commits to an awareness-raising programme, but we could find no details of this to date. However, industry associations in the UK, including the British Jewellers'

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[13] Posted on Action Aid website, on the 30th April 2003, http://www.actionaid.org/resources/pdfs/ngo.doc, Amnesty International (International Secretariat), Cenadep (DRC), Fatal Transactions (International Secretariat, Amsterdam, the Netherlands), Global Witness (UK), Network Movement for Justice and Development (Sierra Leone), Oxfam International, Partnership Africa Canada (Canada), Action Aid (UK).

[14] The World Diamond Council was formed in 2000 to create a unified industry response to the Conflict Diamond campaigns. It represents the World Federation of Diamond Bourses and the International Diamond Manufacturers Association.

[15] The industry's voluntary chain of warranties was discussed at the World Diamond Congress in London (Nov/ Dec 2002). In late 2002, details were not published and it appears that there were no plans for independent monitoring or penalties for those continuing to trade in conflict diamonds. NGOs are concerned about this but at present are concentrating their energies on the KPCS, without which the industry system is effectively meaningless.

Association and the National Association of Goldsmiths have begun to inform their members (see below).

Global Witness has further intensified its investigations in the diamond trade and has documented evidence of links between diamond trading and the terrorist groups Al Qaeda and Hizbullah and highlights flaws in the KPCS. They claim that the failure of the international community to grasp the challenge of monitoring the system means that money laundering through the diamond trade persists and is undetected by either the KPCS or the warranty system. Moreover, if nothing is done, there will be major challenges to the diamond trade itself:

> *"The issue of the link between diamonds and terrorism is a major test of the claims the diamond industry has made that it has reformed and is serious about the need to protect society an the negative impacts of its trade…..If it takes the same approach as it did with conflict diamonds it will be risking the entire future of the trade…."* (Global Witness 2003: 9).

There are some signs that the call for independent monitoring may be heeded as the chair of De Beers pledged has support for the measures.

> *" I believe that transparent verification of both government and industry procedures is essential to the credibility of the Certification Scheme in the eyes of the world. It is for this reason that the industry wholeheartedly supports the NGO's objectives in securing a credible system of monitoring."*[16]

De Beers, naturally concerned to protect its reputation has been proactive in the conflict diamonds issue since it decided in early 2000 to stop buying any Angolan diamonds (Hart 2002). The JOA chief executive similarly believes that the voluntary warranty system in place to date is 'incomplete' and there is a need for transparency and checks within the system, as should holes be found, the system based on an exchange of paper could become meaningless. However, he acknowledges that the further development of a credible system is difficult because of the 'extreme sensitivity' in the industry. He notes that NGOs were looking for a level of detail that from the point of view of the companies would lead them to disclose confidential business information. The challenge in the development of the KPCS, has been to devise a supply chain system of assurance faithful to the confidential nature of the business relations and also to deal with the problem of conflict diamonds. [17]

The Tucson Tanzanite Protocol

Tanzanite is unique to Tanzania and indeed to a five-mile square radius in the Merelani district close to Arusha. Tanzanite gained rapid popularity following its relatively recent discovery in 1967 and subsequent promotion by the high-class jeweller Tiffany. The market for Tanzanite is estimated at $150 to $300 million a year at the wholesale level; it is very difficult to put a single figure to the trade as price per carat can vary

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[16] De Beers chair Nicky Oppenheimer at the Kimberley Process Plenary on April 29, 2003, cited on the news website http://www.onesky.ca/diamonds/jewellers.html, accessed May 2003.

[17] Matthew Runci, phone interview 23rd May 2003.

from $40 to $400 at wholesale price in Arusha (Bailey 2002a). Most sales of tanzanite are in the USA (70%), but there are emerging markets in Asia and Europe.

There is one large tanzanite concession run by the South African owned company (AFGEM). There are also hundreds of small-scale and artisanal miners operating in the blocks B and D of the designated mining area. Most of these operators, but by no means all, are formally registered and operate through legitimate channels, and are represented by the Tanzania Mineral Dealers Association. The TMDA has mounted complaints about AFGEM on account of its claim to be the only verifiably authentic source of tanzanite, a cause that was taken up by the Tanzanian Minister for Energy and Minerals (Sarwatt 2002). The fact remains however that a considerable volume of tanzanite is smuggled (Global Witness 2003: 17).

In early 2002 allegations in the media of a link between illicit trade in tanzanite and funding of al Qaeda, led to suspension of trading in tanzanite by some high profile retailers such as Tiffany in New York (Beard and Kondo 2002). The industry responded by drawing up the Tucson Tanzanite Protocol, which was negotiated between industry players and Tanzanian and US government officials in February 2002.[18] The main feature is a system of warranties to track tanzanite from the mines to the final consumer (Beard and Kondo 2002). The Tanzanian Ministry of Energy and Minerals is committed to better enforcement of mining licensing regulations, including requirements for miners to have identification cards and licensing of tanzanite dealers. The Protocol also 'endorses long term planning to promote greater economic development of all aspects of the gemstone trade in Tanzania' (JVC 2002). The industry is committed to 'a detailed ongoing analysis of the market chain for tanzanite to determine what improvements can be made to prevent possible abuses in the manner in which this product is brought to market' (Tucson Protocol as reproduced by JVC 2002).

The media has not propagated any more scare stories and following the US intelligence reports that quashed the original allegations (the US State Department's Office of East African Affairs found no evidence that any terrorist group is using tanzanite to fund terror), panic in the industry has died down. However, Global Witness argues that this denial was a little too hurried and has provided evidence that there remain Al Qaeda links to the trade (2003: 17-18). Moreover, the jury is still out on how effective the Protocol is, notes a spokesperson for the Jewellers of America; nevertheless, the industry stakeholders committed to implement the Protocol. NGOs have similar concerns about the Tucson Protocol as with the KPCS:

> *"Due to the voluntary nature of the Protocol and the complete lack of any government monitoring provisions Global Witness believe the Protocol to be seriously flawed".*
> (Global Witness 2003: 18)

[18] Parties to the document were the Government of Tanzania, AGTA, JVC, Jewelers of America, TAMIDA, the Arusha Regional Miners Association, the Tanzanian Chamber of Mines, the American Gem Society, the Manufacturing Jewelers and Suppliers of America, the International Colored Gemstone Association, the Jewelers Association of Jaipur, and the Indian Diamond and Colorstone Association, all trade associations representing the full international scope of tanzanite miners, gemstone dealers, manufacturers, suppliers and the retail jewelry industry in the United States. (Press release of the American Gem Association, 11th March 2002, http://www.agta.org/consumer/news/20020311tanzaniteintegrity.htm)

The Tucson Protocol is largely a measure to provide consumer confidence on the legitimacy of the general trade in tanzanite; it says no more than that laws regarding mining and trading have been followed. The Protocol does not commit to monitoring of its chain of custody system and relies on the consumer to demand a stone from a legitimate source. Moreover the working conditions of miners and processors are not covered by the text. Nevertheless, the fact that it has been considered possible to track and certify the trading chain for tanzanite, indicates that such systems are not restricted to the diamond industry.

UK jewellery industry initiatives

The UK industry and KPCS

Whilst traders and manufacturers are becoming more aware of ethical issues in the jewellery supply chain, this is less true for retailers. In the autumn of 2002, Action Aid claimed that UK jewellery retailers have a sketchy knowledge of conflict diamonds and no knowledge of the Kimberley Process and the system of industry warranties. This was on the basis of visits in August 2002 to several London outlets by researchers posing as concerned consumers. Retailers at the both value and high-class ends of the market had low levels of awareness and tended to misinform the customers. However, industry sources question the methodology of the study, noting that owners and managers would have been more appropriate people to quiz than shop floor staff, particularly before the Kimberley Process had begun to be implemented. Nevertheless, this report appeared to spur the industry into action. Moreover, it is interesting to note that 'the higher end retailers seemed to be more aware of the issue, but believed that the source of their diamonds could be trusted because they deal with reputable suppliers' (Action Aid 2002). This trust, especially when combined with ignorance of the supply chain issues, claims the NGO, is no substitute for a proper system. Action Aid argues that there is a real need for an extensive educational programme within the industry on the problem of conflict diamonds and the steps being taken to resolve it.

A spokesperson for Beaverbrooks (one of the jewellers that was not included in the Action Aid survey) acknowledged that the general level of awareness among shop floor staff was 'limited', despite some initial briefings from management (Rj 2002). The BJA and NAG are now collaborating to educate their members and other jewellers about conflict diamonds and the KPCS, see Box 4.1 (Rj 2003). Industry voluntary activities are being backed up by the Government Diamond Office in the FCO which distributes briefings on KPCS inter-governmental dialogue and has convened meetings with the industry to raise awareness and promote compliance.

More UK consumers now know about conflict diamonds than three years ago: a poll conducted for Action Aid indicates that 25% of people in Britain now know about conflict diamonds, compared to just 9% in May 2000 (Action Aid 2003b). Action Aid and other NGOs have been trying to raise public awareness of conflict diamonds and the Kimberley Process (see chapter 5).

Box 4.1 Industry Awareness Raising on Conflict Diamonds and KPCS

- BJA has updated its code of ethics to reflect KPCS requirements, including an eight point code of conduct entitled 'Keep Diamonds Free of Conflict'
- BJA and NAG agreement to adopt the self-regulation code of conduct issued by the World Diamond Council
- Promotion of the KPCS/warranty system and awareness raising on conflict diamonds at trade fairs
- Stickers with WDC declaration on conflict diamonds produced by BJA for members to attach to invoices, once they have written confirmation from their diamond suppliers as to the provenance of their diamonds
- NAG is distributing an information pack explaining KPCS and with a model letter retailers can send to suppliers to request a warranty and suggested responses for media and other public communications, including dialogue with consumers
- NAG is adding to and amending its training material for members to reflect the KPCS
- NAG and BJA have met with NGOs such as Action Aid to discuss action (initial meeting in January 2003 in which they agreed to put pressure on the World Diamond Council and diamond bourses for monitoring of the KPCS)
- Space in industry magazine, The Jeweller, given to Action Aid to set out their campaign (June 2002)
- Conflict Diamonds are on the agenda for discussions at the Sector Committee, the national steering group for the industry (co-ordinated by the Department for Trade and Industry)
- Involvement in the industry meetings convened by the Government Diamond Office
- Engagement with the media on the issue by NAG and BJA (e.g. chief executive of NAG interviewed on Radio 4 in December 2002)
- NAG is in contact with the Jewelers of America
- Action Aid and Global Witness to participate in debate at the International Jewellery Show in London in September 2003
- Dialogue within the industry on the potential to collaboratively produce material for retail counters

Source: Interviews with Michael Hoare NAG (21/05/03), Geoff Field BJA (17/6/03) and Bethan Brookes Action Aid (20/06/03), Jewellery in Britain 2003a, rj 2003

JDA and the ethical trading group

The Jewellery Distributors Association[19] which represents wholesalers and importers in the fashion/costume jewellery sector has been grappling with ethical issues along the supply chain, initially as a result of the demands of its members' main buyers. As noted above, an increasingly important channel for the sale of costume jewellery in the UK is fashion clothing retailers. Many of these companies have been involved in ethical supply chain management for their clothing lines for four or five years now (especially those linked to the Ethical Trading Initiative or the target of NGO campaigns on working conditions in the garment industry) and have begun to turn their attention to the supply chains of other product lines including jewellery and accessories.

The JDA is trying to help members in their relations with buyers and keep them informed as regards the new requirements and also to let retailers understand conditions

[19] Based on phone interviews with Lynn Snead (manager), 21/05/03 and Andrew Ross, chair, 22/05/03.

in factories and the complexities of supply chains (where sub-contracting and homeworking are quite common). A meeting of members and key buyers was convened in February 2001, with a view to standardising some of the requests from buyers and exploring the potential for sharing factory audit information. However, the meeting was inconclusive as buyers were looking for different things and because of objections among JDA members to disclosing supplier information, as in many cases this is the main asset of their business and is commercially confidential.

US jewellery industry initiatives
Like CIBJO, the Jewelers of America[20] which represents jewellery retailers in the USA has been concerned about 'conventional' ethical issues in the trade, such as trade descriptions. However, over the last two to three years, 'societal issues' have manifested themselves in the jewellery industry, primarily because of their exposure to 'conflict diamonds'. Issues that have come onto the agenda include environmental impacts of mining and use of natural resources, poor labour practices and how they might touch the jewellery manufacture and retailing industry, even if they have not directly affected them as yet.

An important part of this project was to develop a framework of principles (JOA 2002) which covers a commitment to human rights as well as core labour rights and refers to key corporate social responsibility instruments such as the UN Global Compact. The organisation has recently commissioned an investigation into key issues along the supply chain, assigning them risk factors. At this point they have identified two particular issues with high risks:

1) Gold mining and the environment, a topic on which a coalition of NGOs have been working; for example, the use of cyanide.
2) Labour rights, especially child labour in gem stone cutting and polishing with a geographic focus on India, Pakistan and South Asia in general.

In order to tackle these issues and to begin to implement the framework of principles, JOA is considering the development of a supplier code of ethics/ terms of reference for use by jewellers in their relations with suppliers. At the same time JOA itself is reaching out to public stakeholders (e.g. ICEM) to engage in dialogue regarding expectations and to help them understand the JOA/retailers' capabilities. The JOA points out that putting ethical principles into practice is a major challenge in the industry, because of its history and structure:

Company level approaches
We can distinguish two basic approaches to ethical business practice at the individual company level:

a) Vertical integration in order to control the supply chain and mitigate potential environmental and social problems through direct supervision.
b) Development of partnerships with producers

We have two examples to present here, at very different scales and very different profiles: AFGEM is an example of a vertically integrated company and Silverchili is a jewellery designer-retailer that has developed a partnership with its suppliers in Mexico on the basis of fair trade.

[20] Based on phone interview with Matthew Runci, chief executive, 23rd May 2003.

A vertically integrated approach: AFGEM
The story to date of AFGEM offers a number of insights regarding the challenges and pitfalls that may face a company trying to assert itself as an innovative and ethical company in the jewellery sector. The company is innovative, apparently follows the letter of the law, has a strong brand image and makes an assertive claim to ethical business practices. However, this has not been unproblematic.

AFGEM is a South African company dealing primarily in tanzanite which it sources from its own mine in Mererani, the only large scale mining concession in the area, awarded in the late 1990s; other mines are small-scale or artisanal operations. In many ways AFGEM is unique in the gemstone sector as it is a vertically integrated company, involved all along the supply chain, which in many respects makes it more like a diamond company than part of the gemstone industry which tends to be fragmented. AFGEM's main activity is along the tanzanite supply chain, but it is a wholesaler of other gemstones.

AFGEM is keen to assert its ethical credentials. Its website refers to the Environmental Impact Assessment conducted on the concession in 2000:

> *"The main finding of the EIA was that AFGEM's presence will have an overall positive impact on the environment, providing significant socio-economic benefits to the region. Environmental management infrastructure is being financed out of project capital, while ongoing rehabilitation will be funded out of working costs. Water quality, respirable dust and noise will be constantly monitored over the life of mine"*

The company's website asserts a number of economic and social development benefits that will accrue to the local community as a result of its mining operations and sets out its plans for investment in social welfare facilities for local community:

> *"Focused community development projects have been initiated, including a Primary School, a medi-clinic and a church, with plans for others in the pipeline. AFGEM also provides water to the local community and its cattle"*

Approximately three hundred jobs are available to local people (Bailey 2002c). AFGEM also hopes to stimulate growth in demand for tanzanite through offering a more reliable supply of the stone than has hitherto been available (Bailey 2002a).

The AFGEM concession in Block C at Merelani started production in 2002 from its three-shaft mine system, up to a depth of 300m (Bailey 2002b). It is a large-scale operation that is estimated to yield 22 million carats of tanzanite over the projected 19 year life span of the mine, which operates with tight security and high technology equipment (Weldon 2001).

The decision by the government to award a large-scale concession to AFGEM has not been a popular decision locally. Partly this is related to disgruntled artisanal and small scale miners who are fearful of losing their market to the larger company with the capacity to brand its gems (Sarwatt 2002). There have been media reports of violent clashes between AFGEM personnel and the local small-scale miners known as wanaapolo, including some fatal shootings (Sarwatt 2002, Weldon 2001). However,

AFGEM does actually buy some gems from a small number of small miners who have leases close to its own concession.

AFGEM has an innovative marketing strategy that is based upon a strong internet presence and branding and promotion undertaken by the Tanzanite Foundation, which is owned and controlled by AFGEM. AFGEM has developed a sophisticated laser marking system that is used to identify and authenticate tanzanite coming from the AFGEM mine. Its marketing materials claim that a consumer can only be sure of getting genuine tanzanite if it has a Tanzanite Foundation mark. Website promotional material also emphasises that proper environmental assessments have been undertaken. '*Look for the Tanzanite Foundation inscription on every Tanzanite gem. It is your guarantee of authenticity, quality and ethical route to market*.'

AFGEM's proposed marketing and distribution systems have also raised the hackles of many in the jewellery trade in the USA who are fearful of being either cut out of the trade, or being subject to close controls similar to the De Beers' sight-holder system (Weldon 2001).

AFGEM's approach has sought to control as much of the supply chain as possible and it is claiming to be ethical on the basis of its production of an authenticated product, and an environmentally benign mining process. However it has upset many stakeholders and has been involved in violent disputes. Conflict around the perimeter fence of mining concessions is not new to the mining and minerals industry, and many of the allegations against the company are likely to be pre-emptive defensive strikes by less efficient competitors, but in view of the ethical claims of the business one might have expected that the company would have adopted a more far-sighted stakeholder engagement policy. It would be interesting to explore the scope of the EIA conducted by the company with regard to the extent to which it covered social and economic factors.

Fair trade partnerships in jewellery: Silverchili

Fair Trade is an approach to trade that has a strong development rationale, based on introducing previously excluded producers to potentially lucrative markets, building up the capacity of producers to trade effectively in the market and offering them a good price. Fundamentally, Fair Trade aims to benefit primary producers and attempts to sell their produce to a niche market of consumers that are willing to buy goods that are identified as 'Fair Trade' and for the benefit of the producer, often at a premium price[21].

There are two basic approaches to fair trade: a) the brand approach, adopted by many ATOs and b) the labelling approach. In the brand approach, fair trade is expressed through the practices of the organisation and their partners and rather than externally designed standards. The ATO sets objectives for its trading relationships which may be customised for different groups or situations, but usually building on a generic model. The ATO then relies on its reputation and brand name to convey to the consumer that the product has been traded according to fair trade principles. In the labelling model, the organisation seeking the fair trade label must achieve certain basic minimum criteria set out in a fair trade standard for trade in the particular commodity. It is the more

[21] A Fair Trade premium is an extra payment that is to contribute to development, and its use is usually democratically determined by the producer organisation.

process-oriented 'brand' approach that fair trade jewellery companies such as Silverchili have adopted.[22]

Silverchili was established in late 1999 and is based on internet retailing of high quality Mexican jewellery traded on a fair trade basis. It has been accepted as a member of the British Association of Fair Trade Shops (BAFTS).[23] This innovative company is still quite small and sources from a small number of identified producers in the Taxco region of Mexico who are linked to a co-operative and union. When working in the area, one of the current directors observed the problems silversmiths were facing in marketing their jewellery, which inspired the formation of the company. The remoteness of the producers meant that they were forced to sell to a local cartel of dealers who delayed payments and paid very low prices.

Silverchilli offers an alternative marketing outlet for these producers, negotiates a fair price, including an advance and also provides advice on design. Its fair trade principles are set out in Box 4.

Box 4.2 Silverchili Fair Trade Principles

Fair trade is better than aid. It builds a sustainable future on producers' own abilities, with the main objective being to improve the producers' quality of life. Aspects of fair trade include:

- Producers receive a fair price for their goods and advances on orders.
- Fair Trade organisations work with producers to provide quality products.
- Purchase and marketing of producers' goods are conducted according to high ethical standards; continuity of orders is important.
- Sources, production and workplaces do not exploit people or the environment.
- Products have meaning above their tangible attributes; consumers are informed about the people who make the products they purchase, increasing their loyalty and understanding that their purchasing power makes a difference.
- Cultural exchanges between people in the South (developing countries) and people in the North (western countries) are encouraged.

Silverchilli.com is working to implement these ethics in a number of ways:

-· We pay for the production of your ordered item in advance.
-· We have spent time capacity building the communities to cost the items accurately so that they make a good living from the products you buy.
-· We design the products in conjunction with the Silversmiths.
-· We are working to delivery times stated by the communities we work with, not us.
-· We return 95% of our profits back to the community.

Source: Silverchili website: http://www.silverchilli.com/fairtrade.htm

For Silverchilli, paying a good price is important to their mission, but their central ethic can be summarised as transparency. The company has a clear agreement with the producers, setting out mutual commitments. The items to be produced are clearly specified in a short and comprehensible quality control manual. All documents are written in both English and Spanish, page by page. A stable and transparent

[22] More detail on fair trade approaches can be found in Tallontire 2000 and 2002.
[23] BAFTS sets out criteria for membership and is linked to a European network of similar organisations and endorses internationally agreed Fair Trade principles known as FINE.

relationship between the producer and the buyer (and communicating this relationship to consumers) really distinguishes them from other companies in the industry.

Ethical trade in the case of Silverchilli is the relationship between the producer and buyer. The scope of their ethical concern does not extend further downstream along the supply chain to sourcing of the silver or gems used in the production of the jewellery.

Key issues in the fair trade approach to the jewellery business include:

- A decision about how far back down the chain that ethical issues are embraced and can be communicated and assured by the brand company
- Transparency and openness in relations between the brand company and producer

Summary

The jewellery industry is characterised by a proliferation of smallscale miners and a small number of large producing companies. At the distribution end there are predominantly small and unbranded companies and a handful of branded retailers. In the middle are thousands of small traders who are invisible to the public. Their trading relations are incredibly private; they hide information on buying sources and sales destinations from their competitors. As with many small companies, businesses all along the supply chain (whether small traders or retailers) are largely unconnected to public or consumer attitudes. It is therefore difficult to make them see how relevant the supply base and production issues are to their business. It is necessary to convince them of the importance of the issues in language they understand, sensitise them and raise their awareness.

To date, action on ethical issues in the industry is dominated by the KPCS but the scope of ethical action is being widened by Jewelers of America which has projects focusing on labour issues in gem and jewellery processing and environmental issues in mining. Some individual jewellery businesses, often characterised as fair trade, have focused more on the development of partnerships with suppliers.

- Demand for jewellery in the UK is increasing, especially on account of the wider availability of imports
- The UK jewellery manufacturing industry is involved in a government sponsored campaign to improve its competitiveness
- The retail market for jewellery in the UK is polarised between relatively cheap chains and smaller up market stores
- In the up-market segments branding and closer relationships between suppliers and retailers are emerging
- Action on ethical issues in the industry is dominated by the Kimberley Process aimed at quashing the trade in conflict diamonds
- The scope of ethical action is being widened by Jewelers of America projects focusing on labour issues in gem and jewellery processing and environmental issues in mining
- There are some jewellery businesses for whom ethics are about the development of fair trade relationships with suppliers

5. Cross-Sector & Cross-Supply Chain Standards and Initiatives

There are increasing numbers of standards and initiatives that are not particular to the mining, processing or retail elements of the jewellery supply chain, or particular to the extractive, manufacturing or jewellery sector. These are often referred to as *Global Standards and Initiatives.* Their proliferation in recent years is predominantly driven by the globalisation of economies, markets and communications, and the absence of any truly global or powerful environmental or social regulatory authority.

Such standards and initiatives address a wide range of issues from labour conditions, health and safety norms through to environmental performance and quality management. They feature significantly in key policy debates on the future of the world economy. According to Nadvi and Waltring (forthcoming), this is apparent at four levels and revolves around the role of these initiatives and standards in: (1) promoting economic efficiency and international trade; (2) reflecting concerns on the social and ecological dimensions of international trade; (3) providing pressure and opportunity to switch from the low to the high road of competitiveness; and, (4) pointing to new forms of global governance.

Social and environmental concerns lie at the heart of the new 'rules' on international trade. Environmentally and socially, the focus of these new standards and initiatives is no longer just about what is produced, but on the way it is produced and delivered (Ibid. 2003). Indeed, it is the encroachment of the social and environmental dimensions of these new global standards and initiatives into supply chains that has caused real debate, since many regard them as non-tariff barriers against less developed countries. However, the momentum is currently with those who see compliance as a means of promoting social and environmental rights internationally, and those who even argue that they should be enshrined in law.

Multilateral institutions like the UN and the ILO have developed and influenced many of these standards and initiatives. However, in contrast to quality assurance standards and initiatives, many environmental and social standards and initiatives are increasingly developed in networks that include civil society, public and private actors (Diller 1999). The latter are increasingly significant for labour and environmental resource intensive sectors operating in value chains where ethical, social and environmental consumer perceptions are core elements of competition (Nadvi and Waltring 2003). Of these standards, it is possible to broadly distinguish between those adopting a process approach and those that adopt a performance approach (NRET 2002). However, a definitive categorisation is rarely attempted.

Process

A process approach is one that defines a process whereby social and/or environmental performance can be managed. There may be guidelines that show what issues need to be looked at (e.g. toxic emissions, waste disposal, participation, worker welfare, health and safety), but there are rarely pre-defined solution or rigidly defined targets that have to be met. A process approach tends to adopt a case-by-case approach to managing responsibility.

Performance

A performance approach is more prescriptive and is mostly used where a company wants to ensure that it is buying either from a supplier or a resource that complies with a tightly prescribed set of social issues.

Codes of practice are the most well known example of performance approaches, typically building on accepted best practice or universal principles of human rights and worker welfare enshrined in international conventions.

It remains unclear what shape these standards and initiatives are going to take in the future. Given their recent proliferation, there are clear benefits to be had from their harmonisation and consolidation. In some areas this is starting to happen. In others, the technical nature of the standard and the specific needs of each sector may require diverse approaches that limit the possibilities, and desirability of such harmonisation (Nadvi and Waltring, 2003: 203).

Key Oversight	**Table 5.1 Summary Overview of Key Global Standards or Initiatives**
International Labour Organisation (ILO)	**Freedom of Association and Collective Bargaining:** (1) Freedom of Association and Protection of the Right to Organise (No.87/1948). Ratified by 73% of ILO members by 2001. (2) Application of the Principles of the Right to Organise (No. 98/1949). Ratified by 83% of the ILO members by 2001. **Forced Labour:** (1) Forced or Compulsory Labour (No.29/1930). Ratified by 86% of ILO members by 2001. (2) Abolition of Forced Labour (No.105/1957). Ratified by 83% of ILO members by 2001. **Non-discrimination:** (1) Equal Remuneration for Men and Women Workers for Work of Equal Value (No.100/1957). Ratified by 82% of ILO members by 2001. (2) Discrimination in Respect of Employment and Occupation (No.111/1958). Ratified by 81% of ILO members by 2001. **Minimum Age:** (1) Minimum age for Admission to Employment (not less than 15 years) (No.138/1973). Ratified by 48% of ILO members by 2001. **Worst Forms of Child Labour:** (1) The Prohibition and Immediate Action for Elimination of the Worst Forms of Child Labour (No.182/1999). Too recent to have ratification statistics.
Social Accountability International (SAI)	The SAI developed a global minimum standard with the objective of harmonising the diverse standards in international trade. **SA8000** tries to transfer the experiences of established quality assurance standards like ISO9000 to social management. Certification bodies, unions, companies and NGOs have participated in developing the standard. The standard incorporates the ILO core labour standards and issues listed above. Like ISO, it is based on a model of factory certification carried out by professional independent auditors trained in the standard. Recognition of SA8000 is relatively widespread, however, use of the standard is more limited and many lead firms, especially in the US, focus on their own firm or sector-specific codes. Nevertheless, SA8000 is currently leading the agenda for harmonisation of the diverse codes and standards of conduct and the development of an international minimum standard.
Ethical Trading Initiative (ETI)	The ETI is a leading national UK initiative. It is a co-operative programme of NGOs, unions, universities, and TNCs aimed at improving the working conditions between TNCs and their suppliers. It is governed by a board of directors which includes DfID. The **ETI base code** is very similar to SA8000 and the ILO core labour standards. However, unlike SA8000, it is not a factory or brand certification programme, and is not subject to generic audit. Instead, the ETI members aim to 'identify and promote good practice in the implementation of codes of labour practices, including the monitoring and independent verification of the observance of code provisions'. Members map and assess labour practices in their supply chain and identify major problems encountered by their suppliers. They then develop an internal monitoring programme and plans for independent certification along the supply chain by NGOs or professional auditors. Thus, ETI does not develop a single form of certification, monitoring or audit procedure.

United Nations Environment Programme (UNEP)	The **Global Reporting Initiative (GRI)** is a long-term, multi-stakeholder, international undertaking whose mission is to develop and disseminate globally applicable sustain-ability reporting guidelines for voluntary use by organisations reporting on the economic, environmental, and social dimensions of their activities, products and services. GRI has recently produced a set of Sustainability Reporting Guidelines (GRI, 2000) (www.globalreporting.org). The GRI encourages reporting organisations to adopt a life-cycle approach and to report comprehensively 'in reference to' or 'in accordance with' its core social, environmental and economic indicators on both the upstream and downstream (indirect) effects of operations and activities. At the same time, the GRI asks reporting organisations to be cautious when reporting on effects that occur once the product or service has been delivered (i.e., effects "outside the factory gates"). Reporters are asked to present a balanced picture, containing both positive and negative effects of their activities.
United Nations (UN)	On the 26th of July 2000, in the meeting at the General Assembly of the United Nations in New York, the leaders of 50 companies, international labour movements and civil society gave their support to **The Global Compact.** The global compact is composed of nine key principles based on the Universal Declaration of Human Rights, the International Labour Organisation's fundamental principles of rights at work and the Rio Principles on environment and development. They principles relate to three key areas of Human Rights, Labour and the Environment. Although the Global Compact has proved popular with many larger companies, and has widespread recognition it has been heavily criticised and discredited by civil society organisations who see it as promoting the legitimacy of big business in international trade while being too general and undemanding to promote real change. A key area of contention concerns the UN's unwillingness to secure a mandate to monitor compliance with the principles, the only major requirement for signatories being to report cases that exemplify their observance.
Fair Trade	Fair trade is a trading partnership which aims at sustainable development for excluded and disadvantaged producers. There are two basic approaches to fair trade: (a) the brand or process approach, adopted by alternative trading organisations such as Traidcraft, who are members of the **International Federation for Alternative Trade (IFAT);** and (b) the fair trade labelling which is a performance approach. Both approaches are focused on ensuring that the producer receives a fair price and experiences a long term trading relationship. Fair trade labelling standards for fair trade in specific commodities have been developed by FLO, **Fairtrade Labelling Organisations International**. In the UK the Fairtrade Foundation is a member of FLO and products carrying the **FairTrade Mark** meet certain minimum criteria (core labour standards in the case of products from enterprises with employees or democratic procedures in the case of products originating from smallholder co-operatives). In the UK, the FairTrade Mark has been awarded to several brands, the majority of them foods, some of which are available in the UK's leading supermarkets. Cut-flowers are a new product bearing a fair trade label in selected markets; research is being undertaken into a fair trade label for clothing.
International Standards Organisation (ISO)	The **ISO 14001** series succeeds ISO 9000, which provided a globally recognised quality management system based on the principles of continuous improvement, auditing monitoring and a management system. ISO14001 provides a globally recognised environmental management system. The series is based on the principles of a register of environmental effects, including inputs, processes and outputs, and measurable continuous improvement based around an audit, monitoring and management system. Unlike the EU's Eco-Management and Audit Scheme (EMAS), it does not require a third party verified public statement. ISO 14001 and EMAS superseded BS7750 in the UK.

Institute of Social and Ethical Accountability (ISEA)	ISEA has been at the forefront of the development of **AccountAbility 1000 Social Accounting Standard**. First released in 1999, it is best described as a framework and process standard for non-financial performance management. It can be contrasted with its contemporary, SA8000, which is a definitive performance standard. It provides an excellent guideline to managers attempting to define social and ethical responsibilities, as it is based on the principle of 'inclusivity' and stakeholder engagement. However, it has been criticised for being dysfunctional in repressive regimes, too logistically intensive, and too open to wayward interpretation. The same criticisms could be levelled at the very recently released (2003) **AA1000S Social Assurance Standard,** nevertheless, this represents the only existing assurance standard for social management systems.
Business in the Community	A significant step has been made in the relationship between business, society and the environment with the publication of the first **Corporate Responsibility Index**. It is the first business-led, voluntary, index, publicly benchmarking the responsible business practices of a range of companies in different business sectors. The new index is a business tool for companies to evaluate their own performance and compare it with their peers. It enables them to assess the extent to which strategy and values are translated into responsible business practice throughout their organisation in the areas of community, environment, marketplace and workplace, to identify performance gaps and make improvements.
World Bank	The World Bank has a whole raft of standards, policies and initiatives relating to environment and social practices associated with commercial project developments and trade developments. These include, but are by no means restricted to; Business Partners for Development (BPD). World Bank guidelines on responsive engagement (OP 4.01 etc). World Bank *Operational Directive OD4.00*. World Bank *Participation Sourcebook.*
Organisation for Economic Cooperation & Development (OECD)	The OECD **Guidelines for Multinational Enterprises** were first agreed upon in 1976 following public concern that multinational enterprises were becoming too powerful and unaccountable following the role of US companies in the Pinochet Coup d'Etat. They were rapidly followed by the ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy. Both fell out of vogue in the environment of deregulation in the 1980s but have since reappeared, and the former was substantially revised in 2000. The new Guidelines are primarily addressed to enterprises based in those countries that adhere to them, but also apply to any OECD based company's operations worldwide. The guidelines are comprehensive and cover general policies, disclosure of information, employment and industrial relations, environment, combating bribery, consumer interests, science and technology, competition and taxation. They are not binding at an international level. However, when a company is believed to be in violation of the guidelines an NGO, trade Union etc. can raise it with the government's National Contact Point (NCP) who is obliged to pursue the case.
British Standards Institute	The **SIGMA project**, through its provision of **SIGMA guidelines**, aims to pull together and build upon much of the existing work on corporate social responsibility and sustainability done elsewhere under one unifying management framework. This, in turn, is supported by a set of operating principles and an implementation tool kit. The SIGMA guidelines are currently being road tested by a wide range of organisations including Vauxhall Motors, Boots, Co-op Bank, PowerGen, DEFRA and BAA.

Derived from: Entico (2003), UN (1999), Zadek (2001), AccountAbility (2003), McIntosh et al. (1998).

6. Mapping of issues and approach to further research

Summary of literature and gap analysis

Our literature review has been based on a variety of sources, both in terms of depth and quality. In compiling and writing this report we have largely maintained a functional separation of this sourced material. In particular, material on mining has been kept separate from processing, distribution and retail. This is partly for ease of analysis and presentation. However, it is also because the vast majority of established literature is based on stages of production along the supply chain rather than links between these stages, or on the jewellery supply chain as a whole. In addition, despite their recognised interconnectivity, studies often focus on spatially separate social and environmental issues and impacts (as discussed in Chapters 1 and 2), or are concerned with local economic or industry developments (as indicated in chapters 3 and 4).

Within these areas we have found differential amounts of data available on different stones and metals and on the measures to control and regulate the industry and trade. Most notably, there is considerable material on conflict diamonds and the Kimberley Process, and labour and environmental issues and standards in large and small-scale gem and silver mining. However, in other areas information is sparse and has had to be gleaned from web-sites, news and consultancy reports. For example, there has been relatively little documented debate and dialogue on labour and environmental issues, programmes and standards in the processing and manufacturing of gems and jewellery, beyond sporadic investigations into the extent of child labour.

In particular, there is relatively little literature on traders and trade links between actors in the gem processing and jewellery industries, or on how jewellery components are sourced. This is partly due to considerable secrecy in the industry and partly due to limited academic interest to date. Traditional economic approaches have been more interested in either individual firms or aggregate trade flows, and the analysis of supply chains generally has only developed in the 1990s.

Exceptions include the studies on gold and diamond supply chains by Hartwick (1998) and Westwood (2000). However, the former is more concerned with the symbolism of consumption and political connections between producers and consumers than analysis of links between stages of production in the supply chain. Westwood's analysis is similarly symbolic, concerned with understanding the constructions of masculinity in the 'romance' of the trade, although it does provide more depth on the business relations in the secretive world of diamond trading.

To date, the jewellery sector appears not to have had the attention of either ethical or business supply chain researchers. Our literature review highlights that even when this neglected area has been documented, it has contained little or no significant analysis of the linkages between the various stages of production in the jewellery supply chain. In contrast, this type of analysis has been conducted and is readily identifiable with respect to a number of other commodities and sectors e.g. Dolan and Humphrey (2000) on horticulture; Ponte (2002) and Gibbon (2001) on coffee; Kazmi and Macfarlane (2003) on sporting goods.

There have therefore been a number of challenges in collating and presenting material on jewellery supply chains, which has frequently entailed consolidating and synthesising established secondary sources of information in one area, while simultaneously conducting primary research or searches for less established secondary 'grey' sources of information in another area. From this we can discern general patterns related to the financial and non-financial operation of the jewellery business as a whole. Most critically, however, it exposes key knowledge gaps related to the development of more holistic ethical strategies and practices within the jewellery sector, allowing us to identify and highlight key areas for further research.

Table 6. Existing documentary knowledge levels in the jewellery supply chain

Production	**Gems**	**Silver**
Extraction	High	High
Trading	Low	Low
Processing	Low / medium	Low / medium
Trading	Low	Low
Production	**Jewellery**	
Manufacture	Low / medium	
Wholesale	Low / medium	
Retail	High	

Developing a phase two research approach

Given the results of the literature review briefly discussed, a research approach that analyses both nodes and their associated linkages along the supply chain would appear to yield the greatest potential in the further development of ethical knowledge in the jewellery sector. In recent years, ethical supply chain research has been the domain of the 'global value chain' approach (GVC). This was developed by Gereffi and Korzeniewicz (1994), and explores how the linkages between the production, distribution and consumption of products are globally interconnected along value chains that embody a network of activities and actors (Kaplinsky, 2000; Sturgeon, 2001). Gereffi has identified four main dimensions of global value chains[24]:

1. An input-output structure or the value-added sequence in the production and consumption of a product;
2. A territorial configuration or the geographical concentration and/or dispersion of production and marketing;
3. A governance structure or the power relations that determine how financial, material and human resources are distributed within the chain; and
4. An institutional framework that identifies how local, national, and international contexts influence activities within chains.

Of these dimensions, the latter two may offer the most significant insights into the nature of the jewellery value chain and identify key activities in creating an ethical jewellery business (or industry). The concept of governance is central to GVC analysis as this determines the way in which developing country producers engage in the chain and how the benefits of trade are distributed along the chain. The original work on governance in GVCs, distinguished between two types of governance structures:

[24] As interpreted by Barrientos et al (2003)

producer-driven and buyer-driven. Producer-driven chains are typical of capital- and technology-intensive industries where trans-national manufacturing firms 'drive' the chain, controlling the core technologies and production facilities, often through vertical integration. In contrast, in buyer-driven chains, large retailers or brand-name companies such as Nike and Walmart make the key decisions about the structure and activities of actors in the chain without actually owning any manufacturing facilities themselves. The dichotomy between buyer and producer driven supply chains has been extended to capture other forms of governance such as international trader-driven supply chains (Gibbon 2001), but the typology is useful when exploring the ways in which power is exercised along the supply chain.

Some researchers have identified flaws in the GVC approach. It has been seen as 'overly static and deterministic' (Raynolds 2002), notably its economic determinism and in practice the focus on sites of production adopted by some researchers, despite of an intention to focus on chains. Alternatives and modifications have included recommending 'commodity networks' and the analysis of 'competing conventions', which acknowledge the relative power of different actors in the network and the multiple directions in which information and power may flow (Ibid. 2002: 406). Similarly Hughes advocates replacing 'chain' with 'network' in order to 'more explicitly capture the complexity of actors and multi-stranded exchange relationships that make up most global commodity systems' (Hughes, 2001: 391).

The research approach recommended for phase 2 would not replicate the considerable amount of existing research on mining, or focus on a particular country, although companies within certain countries would be the initial focus of fieldwork from which the origin of the different components of the selected piece(s) might be traced.

Instead, the research would be aimed at filling in the gaps in knowledge and thereby more clearly identify the options for developing an ethical jewellery business. This research would focus on the supply chain for particular jewellery items, and seek to identify key actors in selected countries, regions and internationally to identify best practice. In particular, it would focus on (a) trading networks between the key activities of mining, processing and jewellery manufacture and (b) social and environmental issues in the sites of gem processing and jewellery manufacture.

This 'supply chain' approach can fill gaps in our understanding of the chain and inform the development of an ethical strategy for the supply chain, by potentially enabling analysis and identification of the:

a) Key actors in the chain
b) Existing ethical practices of these key actors
c) Potential for ethical practice adoption among these key actors
d) Connections and power relations between these key actors.
e) Existing transference of ethical practices along the chain.
f) Potential for transference of ethical practices along the chain
g) Points and drivers in the chain affecting ethical practice adoption along it.
h) Full development and application of ethical jewellery supply chain model.

Developing phase two research objectives

Although the general approach to research in phase two has been identified from knowledge gaps emerging from the literature search, there are a number of strategic factors affecting the choice of key research objectives. These factors affect the exact nature of the research and the choice of criteria that are used for case study selection in phase two. The data and analysis that we have conducted to date indicate that:

- In some sections of the market, particularly for lower priced, mass market items of jewellery, the retailer is likely to have some power over primary suppliers. However there is unlikely to be much traceability beyond first tier suppliers, as there has been no pressure in this segment of the market to understand the supply chain. The primary driver in the market tends to be price and suppliers are in a hierarchical relationship below retailers. This model of retailers attempting to mould suppliers in line with their requirements, is also applicable to costume jewellery.

- In more up-scale segments of the market, branded products, along with the messages they convey, are more important. Producers are usually the brand owners and are increasingly concerned to both protect their reputation and be more in tune with the market. Relationships between producer and retailer are likely to be long term and based on considerable information exchange. However, beyond diamonds and to a lesser extent, tanzanite, there have not been attempts to trace provenance of stones.

- Any one retailer has multiple first tier suppliers, both local and foreign. Some direct long-term relationships are emerging between retailer and manufacturer, but typically a piece of jewellery and its component parts pass through the hands of many different traders. The gem processing and jewellery manufacturing industries are fragmented and trading relations are typically secretive so that detailed mapping is likely to be a very difficult process.

- The fragmentation of the processing and manufacturing industries suggests that the leadership of a central representative organisation is likely to be pivotal to the introduction of ethical initiatives in the sector, especially in relation to gathering support and ensuring the embedding of local understanding. However, such an organisation would have to have some upstream tracing capacity. The necessary extent of this capacity would clearly depend on logistical boundaries, available resources, and the degree of ethical legitimacy that is desired from it.

- The silver extraction industries are predominantly large-scale and legal. Mapping and tracing of their activities and trading networks will be challenging because of the homogeneous characteristics. Nevertheless, the relatively small number of silver producers makes tracing viable.

- The gemstone extraction industries are artisanal and small-scale and often illegal. Primary mapping is likely to be difficult but existing mapping is likely to be available especially for legally produced and traded gemstones and certain gemstones that only naturally occur in certain locations; but

- Once gemstones enter trading networks they may move through many different countries by both legal and illegal means. By illegal means we do not necessarily mean terrorist links or money laundering, but the informal cash transactions that go unrecorded by government, often because of tax evasion.

Within this we can highlight three basic options for the development and application of ethical business strategy and practices. The first two are process oriented whilst the third is performance oriented (we distinguished between these in Chapter 5).

- Internal management systems within a vertically integrated company

- Development of a partnership with suppliers based on good working conditions, fair trading relations and a long-term mutual commitment (akin to a fair trade brand approach)

- Development and implementation of a code of practice for use by suppliers

Based on the above, we can make some tentative assertions about the promotion of ethical practices in jewellery supply chains:

a) It would be easier for a retailer at the higher end of the market selling a branded product to promote itself as an ethical business in the jewellery sector

b) A code of conduct would be easier for an industry as a whole to promote rather than a single company as retailers are unlikely to have much power along the supply chain over multiple suppliers

c) The vertically integrated approach depends upon the availability of capital and the potential for joint ventures and there are issues about how far down and along a network any single business can assert influence, if not control.

Given the overall objective of promoting ethical practice across the jewellery industry as a whole, key issues for Phase 2 would be to:

- Through value chain analysis identify 'drivers' within the chain
- Identify key actors for the promotion of ethical standards
- Consider the nature of ethical standards that would be viable in the industry, including content, scope and approach

Potential collaborating partners or supporters for phase 2.

Potential collaborating partners for phase 2, include government departments (The Department for International Development; Department for Trade and Industry), NGOs (Oxfam, Global Witness, ActionAid) industry bodies (National Association of Goldsmiths, British Jewellers Association) and ethical trade organisations (Ethical Trade Initiative).

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ANNEX 1

Specific environmental impacts of silver recovery as a primary/by-product of gold mining

There are two types of mining employed in the extraction of gold-silver ores: surface and underground. Surface, near surface, or dispersed deposits are normally mined using open pit methods, although river sediments and placer deposits may be extracted by pumping. Deeper deposits or where deposits occur in narrowly defined geological structures (e.g. mineral veins) are exploited using underground methods.

There are two major environmental impacts associated with surface and underground mining of gold and silver. The first is the disposal of mineral wastes generated during the extraction process (e.g. overburden and waste rock) and second is the generation of acid, metal-contaminated waters from waste disposal areas, open pits and underground workings (the issue of mine water is examined in section 2 and table 2.6 in the main report). Mineral wastes may contain sub-economic concentrations of gold, silver, and other potentially toxic metals, which, while not commercially significant, may be environmentally harmful. Wastes from sulphide deposits normally contain significant levels of pyrite, which can react with air and water to form highly acidic, metal contaminated waters. Other releases may be locally significant depending on the characteristics of the site and external environment, for example noise, vibration and dust (from blasting and road haulage), surface subsidence, diesel-related fumes (from mechanical plant), water contamination by nitrates (arising from ammonium nitrate used in blasting) and visual disturbance from operational activities, waste disposal and ore extraction.

The extracted ore must be milled to prepare it for further recovery activities. Uniformly sized particles may be obtained by crushing, grinding, and wet or dry classification. Fugitive dust generated during crushing and grinding activities is usually collected by air pollution control devices and recirculated into the beneficiation circuit. Most operations use water sprays to control dust from milling activities. After milling, sulphide ores may be subjected to oxidation by chlorination, bio-oxidation, roasting, or autoclaving. Roasting of sulphide ores involves heating the ores in air to convert them to oxide ores and break up their physical structure, thus allowing leaching solutions to penetrate and dissolve the gold. Historically, this was the principal pre-treatment, but concerns regarding the emission of sulphur dioxide have prompted a greater uptake of alternatives that do not produce gaseous wastes (e.g. bio-oxidation, which employs bacteria to destroy sulphides and expose contained gold and silver).

A number of different processing routes and techniques are then employed, the choice of which is mainly a function of the ore type:

- Gravity separation – relies on density difference to separate valuable minerals and metals from host rock.

- Amalgamation – used to recover fine gold that is not separable from non-valuable minerals by density alone. It involves the use of mercury to dissolve gold and silver, but due to the toxicity of mercury, its use is largely restricted to developing countries and small-scale (informal) mining operations. At many informal operations in developing countries, even where gravity separation *could* be effectively applied, mercury is often used instead, as the up-front capital costs are low compared to the purchase of gravity separation apparatus.

- Agglomeration – used to form larger particles from fine ores so that leaching solutions passing through the ore do not move too slowly.

- Cyanidation (leaching) – this is the primary means of recovery of fine gold and silver. In this process, solutions of sodium or potassium cyanide are brought into contact with an ore (pre-treated as required) in large-scale heaps of ore, or contained in static or stirred vats. Gold and silver dissolve in the cyanide if the solution is of a high pH and sufficient oxygen is present.

    - As heap leaching is done on a very large-scale, economies of scale allow extremely low-grade material to be economically exploited. However, as much as half of the gold and silver may not be extracted either because the cyanide never contacts the metal or because the metal-bearing solution is trapped in blind channels and cannot pass through the heap. Waste streams from this process include spent ore and leaching solutions as well as residual leach liquor in the pile. Typically, detoxification of the spent ore involves rinsing with water until the cyanide concentration in the effluent is below a specific standard set by the appropriate regulatory agency. The heap may then be reclaimed with wastes in place.

    - Vat leaching allows greater solution control than heap leaching. In this system, prepared ore is placed in a vat or tank and flooded with leach liquor. The solution is continuously cycled through, draining from the bottom of the vat, proceeding to gold recovery, rejuvenation, and returning to the top of the vat. The process is more expensive than heap leaching because the material must be removed from the vat at the end of the leaching process. Spent ore from vat leaching exists in the form of slurry composed of gangue and process water bearing cyanide and cyanide-metal complexes. The spent ore may be treated to neutralize cyanide prior to disposal. The slurry is typically disposed of in a tailings impoundment with some of the liquid component being recirculated to the tank leach as make-up water.

    - High value ores are treated by agitation leaching to maximize the recovery of metal values. The ore is crushed and ground in water to form slurry. Cyanide is usually added at the grinding mill to begin the leaching process and more cyanide may be added to the leaching tanks. Ores may be leached anywhere from 24 to 72 or more hours. Silver ores tend to require longer leaching times.

- Metal recovery following cyanidation – after dissolving the metal, the leach solution is separated from the ore, and the gold and silver are removed from solution in one of several ways: the Merrill-Crowe process (precipitation by addition of zinc metal) or activated carbon loading/stripping.

    - In the Merrill-Crowe process, the solution is mixed with fine zinc powder to precipitate the precious metals. The solids, including the precious metals, are removed from the solution by filtration and the solution is sent back to the leaching circuit. The solids are melted and cast into bars. If silver and gold are present, the bars are called doré. In most cases, the metal is then sent to an off-site refinery.

    - In activated carbon loading/stripping, precious metal leach solutions are brought into contact with activated carbon, which adsorbs the gold and silver. The gold and silver are subsequently stripped into a hot, concentrated alkaline cyanide solution that is then electrolyzed to recover gold and silver on a steel wool cathode. The gold-steel cathode is then sent for further refining. After stripping, the carbon is reactivated on- or off-site and recirculated to the adsorption circuit.

Gold and silver are also recovered from the refining processes for base metals, primarily lead and copper. At copper smelting operations, ultimately copper anodes are produced for electrolytic refining to a higher purity. During refining, “slime" is produced, which may contain

gold and silver. The recovery of precious metals in lead refineries is a normal part of the operation called “desilverizing”.

Some gold-bearing ores contain small quantities of mercury, which is readily extracted by cyanidation. Not only does the presence of mercury decrease the gold-loading capacity of activated carbon, it also has potentially severe consequences for the environment and human health.

During the leaching operations, most of the barren cyanide solution is recycled to leaching activities. However, the build-up of metal impurities may interfere with the dissolution and precipitation of gold and, therefore, require a portion of the solution volume to be bled off and disposed. These solutions may contain free cyanide and metal-cyanide complexes of copper, iron, nickel, and zinc. Other impurities, such as arsenic and that may be mobilized during leaching are considered environmentally hazardous.

Other potentially harmful wastes generated during the processing of gold and silver ores include:

- Filter cakes from zinc precipitation, which may contain gold-cyanide complex, zinc, free cyanide, and lime. This waste is typically sent to tailings impoundments.
- Waste sulfuric acid (corrosive).
- Waste steel wool solution (corrosive).
- Slag from refining processing. This waste may be recycled to leaching and smelting operations and may contain sufficient silver to be considered toxic.
- Wastewater treatment plant sludge may contain toxic concentrations of silver. This waste may be recycled.

The use of cyanide is an increasingly emotive and political issue in the mining industry, and there is a great deal of public concern regarding its use in the recovery of gold and silver. Its public reputation appears to be based more on its theoretical toxicity than the number of actual incidents causing injury or death. In many respects, the concern expressed over the use of cyanide would be more usefully directed towards the presence of metals in wastes, as under properly managed conditions cyanide will degrade to non-toxic end-products (a detoxification route inapplicable to most metal compounds).

Nevertheless, public perception and concern has influenced the regulation and decommissioning of operations where cyanide has been used and the financial assurance expected for the closure of cyanide-bearing tailings. For example, in the State of Alaska, financial assurance must be sufficient to cover the cost of closure of the tailings (including treatment, stabilisation and civil work) *plus* thirty years of post-closure monitoring.

Small-scale mining of gold is a major issue in many developing countries. Typically mercury is used in the recovery of gold, and inevitably significant quantities of mercury are lost to the environment via the air and water. Mercury emissions may directly affect the health of workers and the local population through inhalation of the vapour, or indirectly via contamination of the food chain. A number of UN-led initiatives are underway to identify mechanisms to “formalise” the small-scale mining sector, but these have had a limited impact on the environmental and social issues to date.

Gold and silver mines may also operate or plan to operate in areas considered culturally important or sacred by indigenous groups, opening remote or isolated areas to change that is neither wanted by, or suitable for, indigenous communities and peoples. Stakeholders are responding by asking how mining will affect the sustainability of land-use, alternative land-use

options, long-term ecosystem health, the risks of increased settlement and traditional knowledge resources. These factors taken together are resulting in many local people opposing both the operation of existing sites and the creation of new gold and silver mines. Poor communication between mining companies and stakeholder groups and simultaneously improved global communication, allowing distant mining disasters to directly influence local opinion, is exacerbates this tendency.

Environmental impacts of silver recovery as primary/by-product of lead-zinc mining

Lead most often occurs with zinc in deposits with other sulphide minerals, containing metals such as copper, iron, mercury, arsenic, cadmium, silver, and small quantities of gold. The major lead ore mineral is galena (lead sulphide). Economically viable lead ores range from 3% metal for large, easily accessible mines, to 6% for small, difficult-to-access underground mines or even more than 10% for extremely high-cost, remote areas.

Deposits that contain more than one recoverable metal are referred to as "polymetallic ores", and are described by the dominant economic metal being recovered, followed by lesser constituents. For example, a mine producing mainly lead and some zinc is referred to as a "lead-zinc mine". Polymetallic deposits are becoming increasingly common as high-grade, simple ores are worked out. Due to their complexity, they require more processing than simpler ores and may generate a greater number of waste products.

Lead-zinc ore is mined almost exclusively in underground operations although a few surface operations do exist. Underground mining techniques use shafts, drifts, and adits to access the ore body. As with gold operations, there are two major environmental impacts associated with underground mining of lead-zinc ores. The first is the disposal of mineral wastes generated during the extraction process (e.g. overburden and waste rock) and second is the generation of acid, metal-contaminated waters from waste disposal areas and underground workings (see above). Mineral wastes may contain sub-economic concentrations of lead, zinc and other metals and significant levels of pyrite, which while not commercially significant, may be environmentally harmful. Other releases may be locally significant depending on the characteristics of the site and external environment, for example noise, vibration and dust (from blasting and road haulage), surface subsidence, diesel-related fumes (from mechanical plant), water contamination by nitrates (arising from ammonium nitrate used in blasting) and visual disturbance from operational activities, waste disposal and ore extraction.

Processing of lead-zinc ore begins with crushing and grinding. Following these steps, the ore is further concentrated by flotation. Before the advent of flotation in the early 1900s, gravity concentration was the chief method by which lead ores were concentrated. As a result of more selective reagents and advancements in grinding techniques, flotation has virtually replaced gravity concentration. Gravity concentration techniques, however, may still be used for pre-concentration before energy intensive fine grinding and flotation is employed. The concentrates generated by flotation are then processed further using pyrometallurgical (smelting) routes.

In general, most wastes from the concentration of lead-zinc ores are disposed of in tailings impoundments from which water is likely to be reclaimed during the mine's life. Tailings composed of non-valuable minerals and small quantities of unrecovered lead and other valuable minerals. The liquid component of the tailings is water, dissolved solids, along with any remaining reagents not consumed in the flotation process. These reagents may include cyanide.

In addition to wastes generated as part of mining and flotation processes, lead-zinc mines also store and use a variety of chemicals required by the mine and mill operations. Chemicals may include:

- Hydrogen chloride.

- Methyl chloroform.
- Nitric acid.
- Propane.
- Sodium cyanide.
- Sulphur dioxide.
- Sulphuric acid.

Each of these may represent a potential environmental and health risk.

Primary lead facilities employ pyrometallurgical methods to produce lead. Pelletized concentrates are fed with other materials (e.g. smelter by-products, and coke) to a sinter unit. The sinter process agglomerates fine particles, drives off volatile metals, converts metal sulphides to metal oxides and sulphates, and removes sulphur as sulphur dioxide. The exit gas stream from the sinter is cleaned and routed to an acid plant to produce concentrated sulphuric acid. The sintered material is then introduced into a blast furnace along with coke and fluxes. Inside the blast furnace, the lead is reduced (smelted), and the molten material separates into four layers: lead bullion; "speiss" and "matte", two distinct layers containing recoverable quantities of copper and other metals; and blast furnace slag. The speiss and matte are sold to operators of copper smelters for metals recovery, and the slag is stored and partially recycled. The bullion is drossed (agitated and cooled in a drossing kettle) to remove lead and other metal oxides, which form a layer of dross that floats on the bullion. The dross, composed of roughly 90% lead oxide, along with other elements, is skimmed and sent to a dross furnace for recovery of non-lead mineral values. Slag and residual lead from the dross furnace are returned to the blast furnace. The remaining material is sold to operators of copper smelters for recovery of copper and other precious metals. The lead bullion may then be decopperized before being sent to the refining stages.

Lead refining operations generally consist of several steps, including (in sequence) softening, desilverizing, dezincing, bismuth removal, and final refining. Various other saleable materials may also be removed from the bullion during these steps, such as gold and oxides of antimony, arsenic, tin, and copper. During final refining, lead bullion is mixed with various fluxes and reagents to remove remaining impurities (e.g., calcium, magnesium, and lead oxide). The lead is cooled and the impurities rise to the surface and are removed as slag; the slag may be recycled to the blast furnace. The purified bullion is then cast into ingots.

Zinc is processed through either of two primary processing methods, electrolytic or pyrometallurgical. However, before either method, zinc concentrate is roasted to remove the sulphur from the concentrate and produce impure zinc oxide referred to as roasted concentrate or calcine. In electrolytic zinc processing, calcine is digested with sulphuric acid to form a zinc sulphate solution, from which zinc is deposited by the passage of an electric current. The zinc sulphate solution must be purified prior to electrolysis, otherwise contaminants are also deposited and overall efficiency is low. Purification to remove iron and other trace contaminants produces a problematic sludge material that may also be contaminated with a significant amount of zinc.

In pyrometallurgical processing, calcine is smelted in batch horizontal retorts, externally heated continuous vertical retorts, or electrothermic (electrically heated) furnaces. Zinc is also smelted in blast furnaces using the Imperial Smelting Furnace process, which is capable of recovering both zinc and lead from mixed zinc-lead concentrates.

Both pyrometallurgical and electrolytic processes produce a number of wastes that may be environmentally significant. These include:

- Wastewaters – including plant runoff as well as process wastewaters, may require neutralisation and filtration prior to discharge or recycling. Process wastewaters that contain arsenic, cadmium, chromium, lead, selenium, or silver may be toxic.
- Goethite – generated to remove iron and other impurities from the zinc sulphate solution generated by leaching calcine with sulphuric acid. This waste may be toxic due to the presence of arsenic, cadmium, chromium, lead, mercury, selenium, or silver. Where possible this waste stream is fully recycled to avoid environmental risk associated with its disposal.
- Wastewater treatment plant sludge – results from the treatment of process wastewaters, and may contain toxic concentrations of cadmium.
- Zinc-rich slag – results from the distillation of purified zinc vapor in the electrothermic furnace. It is treated to recover coke and zinc fines, which are recycled to the process, and zinc-lean slag and ferrosilicon.
- Zinc-lean slag – is stored in slag waste piles, disposed in landfill, or sold for such uses as road gravel or construction aggregate, although occasionally it may be contaminated with toxic levels of lead.
- Waste ferrosilicon – this is an inert material and may be sold as a by-product where a suitable market exists.

Environmental impacts of silver recovery as a primary/by-product of copper mining

Copper is one of a limited number of metals that occur in an uncombined form in nature, although commercially significant ores are now almost exclusively comprised of copper-bearing minerals rather than the metal itself. Copper occurs in about 250 minerals. However, only a few of these are commercially important. Deposits considered to be economically recoverable at current market prices may contain as little as 0.5% copper. The principal ore minerals include chalcopyrite (copper iron sulphide), chalcocite (copper sulphide), malachite (copper carbonates) and cuprite and tenorite (copper oxides).

The concentration of copper in ores has decreased steadily over the past thirty years as the higher-grade deposits have been worked out. Relatively low-grade and mineralogically complex ores have now become the focus of production. Advances in technology have offset potential increases in the cost of production, allowing the exploitation of ores that would have in the past been considered uneconomic. Consequently, resources are considered adequate for the foreseeable future, with global land-based resources estimated at 1.6 billion tonnes and deep-sea nodule resources estimated at a further 0.7 billion tonnes.

Copper is mined in approximately 50 countries, two of which - Chile and the USA - account for 46% of world production. Other major copper producing countries include Canada, Australia, Indonesia, Peru, Russia, Indonesia and Zambia.

As with lead-zinc ores, copper may occur with an extremely broad range of metals and minerals, each of which may contribute to the environmental (and ultimately social) impact of an operation. For example, copper is commonly associated with lead, zinc, silver and molybdenum minerals and gold metal. Other environmentally hazardous elements or minerals may also be present, for example, arsenic, cadmium and pyrite, an iron sulphide that in the presence of air and water reacts to generate highly acidic, metal - contaminated waters (acid rock drainage).

In broad terms, there are two types of deposit in which copper minerals are found. The first type is primarily composed of sulphide minerals (e.g. chalcocite and chalcopyrite), while the second

is composed of oxidised minerals (e.g. cuprite, azurite and malachite). Although each type may be mined in a similar fashion, the processing routes to concentrate the minerals and produce copper metal are very different. The associated environmental impacts also differ, both as a result of the minerals present in the ore, and the process route that is applied.

There are three types of mining employed in the extraction of copper: surface, underground and *in-situ* (solution mining). Surface, near surface or dispersed deposits are normally mined using open pit methods. Deeper deposits or where deposits occur in narrowly defined geological structures (e.g. mineral veins) are exploited using underground methods or solution mining. The latter involves the pumping of sulphuric acid down boreholes into the deposit, where it permeates through the ore, before being pumped up another set of boreholes. The copper-laden acid is then processed to recover the metal. The number of sites where this method can be applied is very limited relative to the global number of copper mining operations. As silver production from such is unlikely to be significant, this method is not considered further here.

The two major processes employed to recover copper from ores are classified as either pyrometallurgical (i.e. high temperature) or hydrometallurgical (i.e. water-based). Pyrometallurgical methods consist of conventional smelting technology, and are widely used. Hydrometallurgical methods involve leaching and recovery by precipitation or electrolysis, and are gaining in popularity, although they do not entirely eliminate the environmental and technical problems experienced in pyrometallurgical processing.

Prior to either pyrometallurgical or hydrometallurgical operations, the ore (which often contains less than 1% copper) is crushed and ground with water and placed in a concentrator. The rock/water slurry is subjected to physical and chemical actions inside a flotation tank. Chemical reagents are added to enable copper minerals to float to the surface of the slurry as a froth where they are removed and filtered. The non-copper minerals remain in the bulk slurry, and may be dumped as waste (tailings) or further processed to recover other metal minerals of value, if present.

In cases where the copper ore contains large amounts of clay minerals, 'slime' (a mix of clay minerals and copper values) often forms and is separated from the gangue for further copper recovery. The slime is reground and refloated to remove the copper minerals. Once the copper value is removed, the slime is disposed of with the bulk tailings.

The concentrate resulting from the flotation circuit contains approximately 30% copper and, in some instances, may also contain significant recoverable concentrations of molybdenum. If molybdenum is readily recoverable, the concentrate is sent to the molybdenum plant for recovery (see separate Guidance Note for molybdenum); otherwise, the concentrate is ready for subsequent pyrometallurgical or hydrometallurgical processing, which may be on-site or off-site.

Pyrometallurgical processes employ high-temperature chemical reactions to extract copper from its ores and concentrates. These processes generally are used with copper sulfides and in some cases high-grade oxides. Depending on the copper mineral and the type of equipment, pyrometallurgical recovery may take as many as five steps: roasting, smelting, converting, fire refining, and electrorefining. The products from smelting, converting, fire refining in an anode furnace, and electrolytic refining are copper matte, blister copper, copper anodes, and refined copper, respectively. Roasting dries, heats, and partially removes the sulfur and volatile contaminants from the concentrated ore to produce a calcined material suitable for smelting. Modern copper smelters generally have abandoned roasting as a separate step, and have combined this function with the smelting furnace. However, in older systems using multiple brick hearths, the copper concentrate moves from the top of the hearth towards the base, while air is injected counter-current to the concentrate. The roasted ore leaves through the bottom brick hearth and sulphur dioxide (2-6%) exits through the top.

The smelter furnace produces two separate molten streams: copper-iron-sulphide matte, and slag, as well as sulphur dioxide gas. The smelter slag is essentially a mixture of flux material, iron, and other impurities. The slags from some smelting furnaces are higher in copper content than the original ores taken from the mines, and may therefore be sent to a concentrator for copper recovery. Reverberatory furnaces are being replaced by electric or flash furnaces because they are not as energy efficient, and they produce large volumes of low concentration sulphur dioxide gas, which is difficult to capture economically. The gases produced by electric smelting are smaller in volume, lower in dust (less than 1%), and have a higher sulphur dioxide concentration, which allows more efficient removal from the gaseous waste stream by conversion to sulphuric acid (a useable or saleable by-product). Gaseous waste streams are also cleaned using electrostatic precipitators to remove dusts, which may be leached to recover contained copper.

In the converter, a high silica flux and compressed air or oxygen are introduced into the molten copper matte. Most of the remaining iron combines with the silica to form converter slag. After removing the slag, additional air or oxygen is blown in to oxidize the sulphur and convert the copper sulphide to blister copper that contains about 99% copper; the sulphur is removed in the form of sulphur dioxide gas, which is converted to high grade sulphuric acid. Depending on the efficiency of conversion to sulphuric acid, differing amounts of sulphur dioxide are emitted to the atmosphere. In the interest of conserving energy and improving efficiency, many companies are now employing flash smelting to produce matte feed.

Oxygen and other impurities in blister copper must be removed before the copper can be fabricated or cast into anodes for electrolytic refining. Blister copper is fire - refined in reverberatory or rotary furnaces known as anode furnaces. When co-located with a smelter or converter, the furnace may receive the blister copper in molten form so remelting is unnecessary. Air is blown in to oxidize some impurities; flux may be added to remove others. The residual sulphur is removed as sulphur dioxide. A slag is generated during anode furnace operation. The final step in fire refining is the reduction of the copper and oxygen removal by feeding a reducing gas such as ammonia or natural gas into the copper while it is still in the anode furnace. The molten copper then is cast into either anodes for further electrolytic refining or wire-rod forms.

Electrolytic refining purifies the copper anodes, by virtually eliminating the oxygen, sulfur, and base metals that limit copper's useful properties. In electrorefining, the copper anodes produced from fire refining are dissolved electrolytically in acidic copper sulphate solution (the electrolyte). The copper is then electrolytically deposited on sheets of purified copper to ultimately produce pure copper with only trace contaminants (e.g. less than a few parts per million) for sale and/or direct use. Electrorefining produces various aqueous waste streams (e.g. process wastewater, bleed electrolyte) that must be treated and discharged, reused, or disposed of. Many operations use wastewater treatment to neutralise these wastes.

Hydrometallurgical copper recovery is the extraction and recovery of copper from ores using aqueous solutions. Hydrometallurgical operations include the following:

- Acid extraction of copper from oxide ores.
- Oxidation and dissolution of sulphides in waste rock from mining, concentrator tailings, or *in situ* ore bodies (e.g., low grade oxide and sulphide mine wastes).
- Dissolution of copper from concentrates to avoid conventional smelting.

In summary, the copper-bearing ore (and in some cases, the overburden) is leached, and then the copper is recovered from the pregnant leachate through precipitation, or solvent extraction and electrowinning.

The simplest form of hydrometallurgical beneficiation of low grade ores, waste rock, and overburden practised at large, open-pit copper mines is dump leaching. In dump leaching, the raw material is leached using a dilute sulphuric acid solution. There are several other types of leaching operations (progressing from least capital intensive and inefficient - using the rock "as is" - to most capital intensive and efficient - using finely ground ore): *in situ*, heap or pile, vat, and heat or agitated leaching. In some cases, roasting is employed prior to leaching in order to enhance the leachability of the material.

The copper-rich leachate (referred to as "pregnant solution") is subjected to further processing while the waste material is either left in place (in the case of dump, *in situ*, heap, or pile leaching) or managed in tailing ponds (in the case of vat, heat, or agitated leaching). The major potential environmental impact of hydrometallurgical beneficiation involves acid seepage into the ground. In addition, hydrometallurgical sludges may contain undissolved metals, acids, and large quantities of water.

Copper is removed from the pregnant leachate through either precipitation onto scrap iron or using solvent extraction and electrowinning. Cementation is a more simple process, but has declined in importance, as the copper produced is invariably iron-contaminated, and requires further purification.

In solvent extraction (now, the most popular process), an organic chemical that extracts copper but not impurity metals is mixed with the copper-rich leach solution. The copper-laden organic solution is then separated from the leachate and mixed with concentrated sulphuric acid, to which the copper migrates. The acid copper-bearing solution is then electrolysed to recover copper metal.

ANNEX 2 People consulted

Name/ organisation	Date
Matthew Runci, Jewelers of America Ethical Initiatives Project	23/05/03
Bethan Brookes, Policy Officer, Action Aid	20/6/03
Jane Moyer, press officer, Action Aid	13/06/03
Andrew Ross Jewellery Distributors Association, Ethical Trade Group	22/05/03
Lynn Snead, manager of Jewellery Distributors Association,	21/05/03
Daniel Dower, Dower and Hall	16/05/03
Geoff Field, Chief Executive, British Jewellery Association	17/06/03
Karen Camp, Department of Trade and Industry, Specialist on Giftware, Jewellery and Tableware sectors	16/05/03
Joe Butler, Government Diamond Office, FCO	16/05/03
Michael Hoare, Chief Executive, National Association of Goldsmiths of Great Britain and Ireland	21/05/03
Jenny Middleton, editor of Rj (formerly known as the "Retail Jeweller")	21/05/03
Silverchili, Fair trade jewellery company	23/06/03

ANNEX 3: World Diamond Council Warranty System

World Diamond Congress - Resolution

INDUSTRY SYSTEM OF SELF-REGULATION

The World Federation of Diamond Bourses and the International Diamond Manufacturers Association, recognizing that the trade in conflict diamonds is a matter of serious international concern being addressed by governments, industry and civil society in the Kimberley Process, and mindful of the unacceptable suffering of innocent people, unanimously adopted the following resolution at their joint meeting in London on October 29, 2002:

1. To meet the challenge of preventing the trade of conflict diamonds, both organizations, and their constituent and affiliated members hereby create the following voluntary system of industry self-regulation in order to comply and support government undertakings of the Kimberley Process.

2. Each member organization undertakes to require its members to:

SYSTEM OF WARRANTIES:

2.1 Make the following affirmative statement on all invoices for the sale of rough diamonds, polished diamonds and jewelry containing diamonds. "The diamonds herein invoiced have been purchased from legitimate sources not involved in funding conflict and in compliance with United Nations resolutions. The seller hereby guarantees that these diamonds are conflict free, based on personal knowledge and/or written guarantees provided by the supplier of these diamonds."

CODE OF CONDUCT:

2.2 Not to buy any diamonds from firms that do not include the above statement on their invoices.

2.3 Not to buy any diamonds from suspect or unknown sources of supply and/or that originate in countries that have not implemented the Kimberley Process International Certification Scheme.

2.4 Not to buy diamonds from any source that after a legally binding due process system has been found to have violated government regulations restricting the trade in conflict diamonds.

2.5 Not to buy diamonds in or from any region that is subject to an advisory by a governmental authority that conflict diamonds are emanating from or available for sale in such region unless such diamonds have been exported from such region in compliance with Kimberley Process requirements.

2.6 Not to knowingly buy or sell or assist others to buy or sell conflict diamonds.

2.7 Assure that all company employees that buy or sell diamonds within the diamond trade are well-informed regarding trade resolutions and government regulations restricting the trade in conflict diamonds.

3. Each member organization shall expel and publicize the expulsion of any members that after a due process investigation by the member's trade organization has been found to be in violation of the above resolutions.

4. In coordination with and upon the advice of governmental authorities each member organization shall publicize within the diamond trade:

4.1 All government regulations governing the flow of conflict diamonds and all advisories from government regarding the trade of conflict diamonds.

4.2 The names of firms and/or individuals that after legally binding due process have been found to be guilty of violating Kimberley Process requirements (including government regulations) applicable to the trade in conflict diamonds.

4.3 The names of all regions and locations that governmental authorities advise that conflict diamonds are emanating from or available for sale.

5. Each member organization shall assist and provide technical support regarding government regulations and trade resolutions restricting the trade in conflict diamonds to all legitimate parties in need of such information or expertise.

Done this day in London, October 29, 2002.

Source: World Diamond Council 2000a

Natural Resources Institute

(NRI) is a specialist institute of the University of Greenwich, providing research, consultancy, training and advisory services to underpin sustainable development. The majority of our activities focus on the harnessing of natural and human capital for the benefit of developing countries, though much of our expertise has proved to be of growing relevance to the industrialised nations of the North.

As part of the University, NRI has strong links with professionals operating in health, education, law, business, architecture and engineering. This intellectual capital is brought to bear on interdisciplinary and cross-sectoral approaches to improve the quality of life of the rural and urban poor. NRI subscribes to the International Development Targets and works with donor organisations to achieve them.

Partnerships are integral to NRI's operation, encompassing the full range of stakeholders in international development from donors to community-based organisations. NRI plays an important role in relation to capacity building in developing countries through its activities in consultancy, training and advice with in-country institutions.

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