The London School of Economics and Political Science

Mining Enterprises and Regional Economic Development: An Exploratory Analysis of the Sustainable Development Model

Nicolas Di Boscio

Thesis submitted to the London School of Economics for the degree of Doctor of Philosophy
London, March 2010

Declaration

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I wish to extend my thanks to Rio Tinto for the data and material provided and for their support throughout the investigation. As a Rio Tinto employee at the time of writing, I declare that no attempt to interfere with this work or to influence the results of this research has been made by the company or any of its employees. All the views and conclusions put forward are solely my own and do not necessarily represent those of the corporation.

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Acronyms

ABA	Arandis Business Association
ABS	Australian Bureau of Statistics
ASP	Arandis Sustainability Project
ATC	Arandis Town Centre
BEE	Black Economic Empowerment
CDEP	Community Development Employment Project
C&E	Communities and Environment
CEO	Chief Executive Officer

CI	Community Investment
CRD	Comite Régional pour le Développement de l'Anosy
CSR	Corporate Social Responsibility
DFID	(UK) Department for International Development
EC	European Commission
ECLAC	Economic Commission for Latin America and the Caribbean
EITI	Extractive Industries Transparency Initiative
EPZ	Export Processing Zone
FDI	Foreign Direct Investment
FIFO	Fly-in and Fly-out
GDA	Global Development Alliance
GDP	Gross Domestic Product
GMI	Global Mining Initiative
GNP	Gross National Product
GRI	Global Reporting Initiative
GRP	Gross Regional Product
HR	Human Resources
ICMM	International Council for Metals and Minerals
IFC	International Finance Corporation
IMF	International Monetary Fund
I/O	Input/Output
ISI	Import Substitution Industrialisation
LED	Local Economic Development
LGA	Local Government Authorities
LNG	Liquefied Natural Gas
MCT	Mining Curse Theory
MLA	Multilateral Agency
MSCI	Morgan Stanley Capital International
MMSD	Mining Metals and Sustainable Development project
NIMT	Namibian Institute for Modern Technology
NGO	Non-Governmental Organisation
NPV	Net Present Value
PI	Pilbara Iron
PIC	Pôles Intègres de Croissance

PGRM	Project de Gouvernance des Ressources Minérales
PNG	Papua New Guinea
PRD	Plan Régional de Développement
PRSP	Poverty Reduction Strategy Paper
QMM	QIT Madagascar Minerals
RCT	Resource Curse Theory
R&D	Research and Development
RF	Rössing Foundation
RUL	Rössing Uranium Limited
SDR	Schéma de Développement Régional de l'Anosy
SIR	Stratégie d'Investissement Régional
SD	Sustainable Development
SME	Small and Medium Enterprises
STD	Sexually Transmitted Disease
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNGC	United Nations Global Compact
US	United States
WA	Western Australia
WB	World Bank
WBEIR	World Bank Extractive Industries Review
WWII	World War 2

Abstract

Towards the end of the 1990s, and in response to increasing global condemnation, the mining industry adopted sustainable development (SD) principles and standards through corporate social responsibility (CSR) initiatives. This approach not only proposed a dramatic change in the operating practices of large mining houses, but also suggested a grand vision for the industry as a long term catalyser of local economic growth. This research now investigates the effect that mining enterprises which operate under these principles have on sub-national economic development. In doing so, it undertakes multiple case-study analysis, focussing on a single firm, Rio Tinto, and covers three of its subsidiary companies at various stages of development. Consistent with claims by mining advocates, this work confirms the frequently striking importance that large mines have for sub-national economies. However, this investigation disagrees with the emphasis typically attributed to each stream of benefits and brings attention back to the use that mining cash flows are put to. More generally, the study argues that the potential for large mining firms to trigger endogenous growth has been underestimated. On the one hand, these enterprises can contribute distinctly to local capital accumulation; on the other, under certain circumstances, they can also help sustain increases in local productivity endogenously. Indeed; while local preconditions will determine socioeconomic outcomes to a significant degree, mining companies can play a critical part in economic planning and the building of innovative institutions, which could, in turn, help increase the underlying local rate of technological absorption, human capital and overall capacity for economic governance. This entails a drastic (and controversial) change from the role previously assumed by companies. Yet, this study also concludes that, in some other cases, SD has promoted unattainable economic expectations. In these cases, minimising the local impact of mining would be a more advisable economic strategy.

Introduction

This research aims to investigate the effect that mining enterprises which operate under the principles of sustainable development (SD) have on economic development at the local and regional level. As such, this work refers to mining as the group of individual industries covering all mining extractions with the exception of oil and gas, including the initial smelting and processing of minerals. This combination of mineral extraction and initial processing is often referred to by mining practitioners as *mining and primary metals*. In addition, this study refers to economic development as an indication of all the measures of economic growth and socio economic welfare found in the relevant literature, including the level of per capita income along with its growth; the incidence of poverty and the alleviation of poverty over time; the distribution of income and changes in its distribution; trends in employment and unemployment, as well as indicators such as literacy, infant mortality, life expectancy and others.

For half a century, theorists have argued that mining has repeatedly undermined economic development. In exploring why, the literature has devoted countless volumes to examining the effect of natural resource specialisation on trade, exchange rates, government revenues, economic linkages with other economic sectors, and the alleged propensity of the industry to diverge the interests of different economic agents. These analyses have been leveraged at the macroeconomic level to the largest extent, and consolidated under the framework of the so-called Resource Curse Theory. More recently, however, academia has come to recognise that in other cases mining has been positive for the economy – and has thus started to consider under which conditions each outcome is more likely. This shift has been underpinned by remarkable breakthroughs in the economic development discipline more generally, which over the last twenty years has started to emphasise the importance of technological absorption and human capital in long term economic growth; explored the microeconomic foundations of economic governance; and taken on the task of consolidating into theory a number of spontaneous reactions to local duress from unconstrained globalisation.

Alongside this conceptual reshaping, the SD agenda has consolidated globally. The notion of sustainable development was actually born as an answer to global concerns over the exhaustion of natural resources whilst acknowledging the need to improve living standards, especially in the poorest regions of the world. With time, the corporate world across the spectrum appropriated the concept as a voluntary response to discontent from the disappointing socioeconomic and environmental performance of multinational firms. In mining more particularly, SD galvanised the ongoing debate around economic development, and brought with it a new sense of purpose to an industry that had been singled out as a 'bad citizen' by an increasingly vocal international community. There was an obvious obstacle confronting this proposition though: how can mining, essentially a finite economic activity, ever be sustainable? In solving this conundrum, the industry adopted the notion of 'soft' sustainability. To some degree, this view assumes the substitutability of human capital for natural capital, and as such, it recognises that the benefits flowing from a mine could be sustained in time if they are properly invested into alternative sources of wealth. This research builds on this assumption, and focuses in particular on economic sustainability. For this reason, purely environmental concerns have been excluded from this analysis.

This research also focuses on the region and the locality, as opposed to the nation. On the face of it, the wealth generated by mining could have been broadly expected to give rise to regional economic development; after all, many successful regions around the world had grown richer on the back of large mining operations. As with national economies, however, some research suggested that this was not the case. Yet, due to the strong bias towards the macro level of the debate, the localised implications of mining had been much less explored than those affecting national states. Sustainable development shifted the focus towards the sub-national level and made apparent that the most evident consequences of mining activities were taking place in the vicinities of the mines. As a result, large corporations redirected efforts nearer their operations; endeavoured to build up better relationships with host communities and to establish close links with local governments; studied their impacts on the immediate environments; and designed and implemented programs to minimise the negative effects of their businesses and to maximise their economic opportunities. Furthermore, the SD model not only proposed a dramatic change in the operating practices of large mining houses, but it also suggested a grand vision for the industry as a long term catalyser of local economic growth.

It has been over a decade since the industry decided to take this route. It is now time to investigate whether the conditions that lead to the embracing of sustainable development have been successfully addressed, and whether mining companies have overcome the problems associated with their legacy, as condemned by the literature in the past. An initial approach should look at the relative scale, and features, of the most direct economic contributions flowing from the mines to the communities. In this regard, a first group of questions should start asking whether the different streams of cash from mining are actually of relevance to the region; whether the resulting jobs benefit locals; whether mining corporations pass their improvements in productivity on to local entrepreneurs; whether the supply chains of these firms help develop local businesses; whether the mineral rent is distributed equitably among local stakeholders; whether companies now consult with communities and local governments; or whether, under sustainable development, companies gave up their old paternalistic ways in favour of longer term and more sustainable approaches. Essentially, it should be established whether the operating practices of large mining multinationals have indeed changed as pledged, and if so, whether the prospects for local development improved accordingly.

While some commentators have started to look at these questions in the exclusive realm of mining companies, they have largely ignored how the affected regions have coped with the stimulus brought in by these operations, or how able have local communities been to respond to the changes posed by the industry more generally. For instance, it has usually been granted that large mines are significant contributors of capital, both in the form of fixed assets and recurrent cash injections into the economy. If so, can local economies take advantage of this thrust and sustain improvements in technological absorption and human capital, in line with the recommendations from modern growth theory, so as to achieve long term economic growth? Similarly, mining has long been seen as a disruption and local promoter of conflict and social tension. Can mining companies under SD change that image and, in turn, help improve local standards of economic governance? Or, at a more conceptual level, could the sustainable development movement, effectively a voluntary approach, ensure the durability and further applicability of corporate initiatives that may not be necessarily related to the essence of mining activities?

Moreover, should the policy objective of local economic growth be pursued in all cases?

In short, this research poses two fundamental questions: under the SD framework, what is the economic effect of a large mining company at the local and regional level; and can a large scale mine operating under the principles of sustainable development became a catalyser of local economic growth? In structuring this research two hypotheses are proposed. The first suggests that large mining operations can indeed have a positive economic effect at the local and regional level, and become catalyser entities for economic development. It is recognised, however, that this statement may accommodate an alternative view; one in which, for instance, mining operations are positively associated with some, but not all, measures of economic development. Nonetheless, a second hypothesis, complementary to the first, puts forward that realising the full economic potential from large mining operations would require proactive economic management at different levels of the local administration, including not only governments, but critically, the private sector. Again, an alternative view may suggest that realising the full development potential from mining actually depends on factors complementary to the level and efficiency of local economic management.

The soundness of this affirmative vision should rest on the existence of a thorough body of research looking at mining companies and their effect on the local and regional economies in which they operate, as well as on a methodical examination of the current policy wisdom in this regard. This debate calls for a set of comprehensive studies exploring, in particular, the interface between mining firms and these economies, so that contributions may be made to the formation of more consistent policy recommendations. Yet, the specialised literature has increasingly pointed to the futility of one-size-fits-all approaches to economic development. As most of the concerns expressed above are, in actual fact, specific to each location, a range of different situations would need to be considered for conclusions to remain widely relevant. Up until this point, such research has remained sparse. While some initial analyses have begun to emerge, it still falls short of a coherent body of theory. To begin to fill this gap is, in effect, the aspiration of this study.

In doing so, this work undertakes multiple case study analysis. The investigation focuses on a single company, Rio Tinto, one of the largest diversified mining multinational corporations, and covers several of its projects at various stages of development. This work is organised in the following way: chapter 1 explores the conceptual background put forward by the proponents of the Resource Curse Theory and argues that the relevant research question has now changed. It also looks at key developments in modern growth theory over the last fifty years and proposes a new linkage between these and the mining industry. Chapter 2 explains how to determine economic contributions from mining companies; investigates the evolution of mining and its role in economic development over time; introduces the concept of sustainable development and soft sustainability, and tells the story of how mining came to embrace this so categorically only just over a decade ago. Chapter 3, in particular, follows Rio Tinto's pathway along this process and introduces the case studies that constitute the core of this investigation. Research methodology is also discussed in this chapter.

Chapters 4, 5, and 6 cover one case study each. While all cases are structured in similar ways, each has singular characteristics that added to the particularities of each study. As such, this work aims to identify and examine both the communalities and specificities coming up from these analyses. That said, the case studies have been conceived as stand alone pieces. For that reason, chapter 7 brings them all together; extracts the fundamental lessons coming up from each; and readdresses the main research questions of this work. It also goes back to the specialised literature discussed in chapters 1 and 2 and compares the conclusions from this work to the relevant propositions previously made by theorists and commentators in this discipline. A short synopsis including the overall conclusion from this research is presented in final chapter 8.

Chapter 1

New developments in growth theory

1.1. Redefining the policy question

It could be assumed that countries with large mineral deposits should consider themselves fortunate. Minerals, like any other asset, are part of the natural capital of a nation and therefore should contribute to wealthier economies. In that view, mining activities are those that can extract economic value from latent wealth in the form of underground mineral deposits, so it could be converted into businesses, education, infrastructure, and other forms of capital that directly contribute to economic development. Likewise, at the local and regional level, it has often been accepted that economic development would be a natural by-product of mining activities, as the east coast of the United States testifies, together with Western Australia and Victoria in Australia or Johannesburg in South Africa, among many others (Eggert 2001).

Yet, over the second half of last century, empirical evidence has questioned the positive relationship between natural resources and economic development, and has argued that large natural resource endowments delay, rather than accelerate growth, promote social distress, and also bring in extensive local disruptions. Based on case studies of individual countries, and then on more comprehensive comparisons among countries from cross-country analyses, a growing number of commentators have reported a negative correlation between the economic specialisation on the exploitation of natural resources and economic development (Auty 1993, 1997, Sachs and Warner 1995, 1999, 1999b, Ross 2001), which has been since commonly referred to as ‘The Resource Curse Theory’ (RCT) – or ‘The Mining Curse Theory’ (MCT), when referring to mining specifically. Attempts to explain the allegedly disappointing performance of some mineral producing countries have been numerous and of a varied nature (Davis and Tilton 2002), though they can be synthesised in the five points below:

1. <u>The declining terms of trade</u>. The prices of primary products may be perpetually falling relative to those of manufactured goods. The implication of this is that countries specialising in primary goods would have to export ever-increasing quantities of these products in order to acquire a given basket of imported manufactures (Prebisch 1950, Singer 1950). This may be explained, at least partially, by the highly competitive nature of commodity markets. While cost

reductions in primary products are often passed on directly to consumers in the form of lower prices, the producers of many manufactured products enjoy some market power, which allows them to divert the benefits of falling costs to shareholders and workers in the form of greater dividends and better salaries. This means that the basket of goods imported by natural resource producer countries from abroad that is available for consumption at any given level of domestic output will decline over time.

2. The high volatility of commodity markets. The short-term volatility of primary commodity markets causes substantial fluctuations in government revenues and foreign exchange earnings in mineral dependent countries, which may hamper economic development (Sachs and Warner 1995, World Bank 2000). The markets for primary products are known for their instability, often showing violent fluctuations in prices over short periods of time. For mineral commodities, this volatility arises because of significant fluctuations of demand for minerals and metals over the business cycle, following shifts in demand in the end-use sectors that consume most mineral commodities: prices are down when demand is down, and vice versa. This means that profits – and thus taxes on profits- are particularly volatile. This makes it difficult for developing countries to count on revenues from the mineral sector, and hampers the effective planning needed for economic development.

3. The Dutch Disease**.** Mineral booms cause labour and capital to flow from agriculture and manufacturing to the mining sector. Once the mineral boom has passed, countries may find it difficult to regain their competitiveness in the traditional export sectors (Auty 1993, 1997, Caves et al 1996, Sachs and Warner 1999, ODI 2006). This macroeconomic phenomenon owes its name to a mineral boom following the expansion of the natural gas sector in the Netherlands during the 1970s, triggering important adjustments in the economy. Typically, these adjustments involve the rise of domestic wages, as the booming mineral industry attracts labour away from agriculture and manufacturing. Further, rising mineral exports cause the domestic currency to appreciate. These developments hamper the more traditional export industries, which have to compete with overseas producers.

4. Mining as an enclave industry. Mining in some instances provides few benefits to mineral producing countries, other than the share of the economic profits or rents captured through taxation (Seers 1964, Baldwin 1966, Ross 2001, WBEIR 2003). The argument here is that mining is detrimental to an economy simply because it has a lower potential for long-term economic growth than alternative activities. This lower-growth potential occurs because production of primary commodities has fewer beneficial backward and forward linkages with the rest of the economy than, say, manufacturing. Another critique of the mining sector is that whilst it creates environmental and social problems at the local level, the communities affected do not share in the wealth created, which flows largely to the central government or abroad. Supplies are often imported, and little value added is carried out domestically. In addition, mining employs few workers, many of which are new to the region. As a result, the host economy gets little from mining besides its share of the profits or economic rents.

5. The use of mineral rent. The profits and rents from mining activities are geographically concentrated, which may promote rent seeking (efforts by groups of individuals or organisations to increase their share of the available profits) at the expense of rent creation (efforts that increase the total profits or wealth available for distribution) (among many others, Sachs and Warner 1999b, WBEIR 2003, Friends of the Earth, undated). Building from Krueger's (1974) work on the social costs of agents seeking to capture monopoly rents, some commentators have argued that large levels of natural resources relative to income generate inefficient economic behaviours and hamper productive economic activities (Khan 2005). Therefore, mining may in cases accentuate the income disparities frequently evident in developing countries. Even worse, conflicts with the distribution of mineral rents may promote corruption, civil unrest, and wars.

These views have impacted vigorously on mainstream development theory, and led in some cases to policy propositions such as the Import Substitution Industrialisation (ISI), which became a widely spread development paradigm after WWII, and is now widely criticised. At present, a new strong policy proposition flowing from this debate can be found in the recommendations by the independent World Bank Extractive Industries Review, which in 2003 concluded that international organisations should be discouraging, rather than encouraging, mining in the developing world (WBEIR 2003).

All of these views have not come without strong dissent, however, and numerous commentators have challenged both the empirical evidence itself as well as the causal relationships referred to above linking mining to poor development performances (Davis 1998, Eggert 2001, Hadass and Williamson 2001, Lederman and Maloney 2002, World Bank 2002, Davis and Tilton 2002). More precisely, they have argued that:

1. Whether or not the terms of trade of countries specialising in primary products are declining, the effect of this on their long-term growth appears to be negligible (e.g. Hadass and Williamson 2001). Moreover, what really matter are margins, rather than absolute prices. If costs of production fall faster than commodity prices – note, for instance, the significant increases of productivity in the mining industry over the last decades –, the benefits flowing to the country from such commodity may be actually rising. Davis and Tilton (2002) cite the case of copper in Chile in the last fifteen years as an example.

2. The volatility experienced by commodity markets is actually not entirely detrimental for economic development. While it does make planning more difficult, downturns in the commodity cycle often force needed changes in the public sector that would not occur under less stressful conditions. Similarly, market slumps provide mining companies with strong incentives to improve their productivity and reduce their operating costs (Eggert 2001). The World Bank (2000) finds that, during the 1990s, high commodity price volatility did not affect the growth prospects for exporters of agricultural and mineral commodities in Sub-Saharan Africa. In addition, governments could always mitigate these

fluctuations by putting their mineral revenues into stabilization funds or other similar instruments[1].

3. The Dutch disease need not be a disease – and may well be seen as beneficial to countries. It simply reflects the mechanism by which a country can benefit from its newly found mineral wealth by encouraging resources to flow from other sectors of the economy to the booming sector. Market economies evolve and change, and some sectors and companies rise while others are in decline (ODI 2006). The Dutch disease represents a change in the structure of a national economy during a period of economic expansion induced by a commodity boom. Davis (1995) argues that this mechanism would only become a disease if (a) there is stress associated with adjusting to change, (b) if governments respond to political pressure and intervene to protect the industries hurt by the structural change, or (c) if the boom in mineral exports is temporary, and it is difficult to restart the traditional export industries once the boom has passed.

4. The argument that mining is typically an enclave industry –i.e. mining has fewer beneficial backward and forward linkages than, for instance, manufacturing-, is far from settled. Existing estimates of the magnitude of the linkages available from a number of input-output and computable general equilibrium models actually suggest that mining is not necessarily disengaged from the rest of the economy, and that the degree of interaction can go from enclave to very well integrated, depending on the maturity and scale of the mining sector in the country and broader economy (e.g. Porter 1984, Stilwell et al 2000). Other commentators (Davis 1998) see no problem with the proposition that mining contributions are mostly in the form of money or rents, as this can support education, public health, infrastructure developments, and other investments that stimulate development. Economic growth requires the creation of wealth; policies that attempt to move away from mining by, for instance, subsidizing industries that would otherwise lose money, destroy wealth.

[1] Administrations such as Alaska, Canada, Chile, Ghana, Norway, Papua New Guinea and Venezuela have used stabilization funds in the past, with different degrees of success.

5. Good governance can prevent corruption and minimise the internal frictions that breed war and violence. It can also prevent the economic incentives that give rise to rent seeking behaviour, and ensure that mining rents are re-invested in human capital and other assets that promote economic development. Sachs and Warner (1999) find that resource-rich nations are more likely to have particularly low scores on international measures of bureaucratic efficiency and institutional quality, but also find that there is nothing inevitable about this correlation.

Generally, mining advocates have also claimed that in light of the urgent, but ambitious, development targets set by the international community (e.g. the UN Millennium Development Goals), the renunciation of such a substantial source of wealth by developing countries appears rather short sighted (ICMM 2003, ODI 2006).

More recently, while the Resource Curse Theory has continued to frame the discussion over mining's contribution to long-term national economic development, a shift in focus has become apparent. As understanding of the macroeconomic effects of mining improved, so the debate moved to the microeconomic level (Humphreys 2000b, 2002). Specifically, it has started to address questions around the longer impact of large individual mining operations, or groups of them, on the local and regional economies where they operate. In fact, it is precisely the effect of mining enterprises at this sub-national level, rather than then national viewpoint, that constitutes the core of this research. Furthermore, while the issue of whether mining represents an intrinsically detrimental path for advancing development still is, in most respects, an open debate, there is an emerging recognition that mineral deposits offer opportunities, which in some cases have been used judiciously to promote development, and in others they have been misused, impairing development (for example, Sachs & Rodriguez 1999b, Humphreys 2000b, Acemoglu 2001, Aroca 2001, Davis and Tilton 2002, Czelousta and Wright 2003, ODI 2006).

It is therefore necessary to change the focus of the policy question, from one that asks whether mining is fundamentally good or bad for the economy, to one that asks what can be done to maximise the positive contributions to economic development from the sector while neutralising its potential negative externalities (Davis and Tilton

2005). Or, to put it differently, to explore under which circumstances mining companies can become a catalyser of regional economic growth. While regional economic development theory made important breakthroughs in the second half of the previous century, this has so far been rarely linked to mineral economies specifically. In addressing this shortcoming, sections two, three and four introduce the fundamental elements of the new development literature, while section five returns to mining and proposes an uncharted link between this body of literature and the activities of large mining corporations.

1.2. New developments in growth theory

Labour productivity[2] in large mines has increased enormously over the last twenty years. US statistics between 1987 and 1997 indicate that productivity growth in the mining industry was the fastest growing among all sectors in the economy[3]. In particular, Humphreys (2000) points out to a shift in the emphasis of productivity growth in mining from being driven almost exclusively by capital to being driven by technology and improved work practices during the 1990s. A steady increase in productivity has been good news for the industry, although its meaning for the local and regional economies is not always clear-cut. While these economies would benefit if increases in mining productivity helped improve the efficiency of factor input utilisation more broadly, there is no clear evidence to believe that this would always be the case (Di Boscio and Humpreys 2004). Within this context, the Endogenous Growth Theory provides good principles for thinking about the relationship between changes in technology and human capital, economic governance, and growth. This section discusses key concepts emerging from this view that are set to play a fundamental role in understanding the potential and challenges that mining economies face at the local and regional level.

Economic development theory has largely assumed that long term economic growth is determined by both factor input accumulation – i.e. quantity of capital, labour, land, energy and so on- and technical progress, also regarded as total factor productivity.

[2] Usually measured as tonnes of rock treated by employee
[3] Data from Triplett J. and Bosworth B. 2000, appeared in The Economist, 23rd of September 2000

The relative weight attributed to these two components has dominated the evolution of growth theory since the end of WWII. Most post-war growth theories heavily stressed the importance of investment (capital) in economic growth[4]. Worldwide development strategies focused on filling the financial gap existing between investment needs and financial availability (e.g. through aid) so that developing economies could increase their capital stock, assumed to be the main necessary ingredient for triggering the development process. Thus, long-established policy responses have often focussed on top-down supply-side initiatives such as the provision of basic transport infrastructure, the construction of businesses' facilities or proposals alike, expected to prompt the economic development process. Results were rather poor. Subsequent research indicated that the relative weight of the two main components of the equation (factor input accumulation and total factor productivity) were incorrect (Easterly 2001). To better comprehend this, it is useful to examine it in the form of a production function.

$$Y = Ae^{\mu t} f\,(K\ L)$$

The production function shows the maximum output that can be produced using specified quantities of inputs, given the existing technical knowledge. The factor inputs are notably capital *K* and labour *L* (land is also important in an agricultural context, but relatively unimportant in modern economies). In the equation above, the variable input capital *K* and labour *L* combine at any given time to produce a given output $f\,(K, L)$. The function *f* shows how much is obtained with specified quantities of the inputs. The term *A*, total factor productivity (TFP), is a constant reflecting the efficiency with which factor inputs are utilised, which is assumed to reflect technological capacity, knowledge, organisation routines etc. Finally, e^{μ} represents the rate at which TFP evolves. For instance, as technical progress takes place, more output is obtained from given inputs. According to the neoclassical theory, e^{μ} is exogenously (i.e. market) driven and is therefore assumed that free markets will most efficiently determine long-term growth.

[4] The best-known and most applied theory in this respect was the so-called Harrold-Domar Model, developed in the mid 1940s.

In this equation, if input factors are increased together, total output will follow, gaining constant returns to scale (economies of scale). In contrast, increasing one input factor independently (say capital) will result in decreasing returns to scale. When increasing machines relative to workers, the return to each additional machine will get lower and lower; if a worker already operates a machine, providing a second machine to the same worker will not double production. In other words, adding more and more capital per worker, k, will increase output per worker, y, but with *diminishing returns* to capital. This means that there is a limit to how much capital accumulation can add to output per capita. The focus is then on production per worker, also called labour productivity. Whilst investment is a very important determinant of change in economic growth, increasing levels of capital cannot alone ensure long-term steady state economic growth. Instead, the return on capital can be sustained if the capital stock increases while total factor productivity rises as well, avoiding diminishing returns in capital through savings on labour[5]. Each worker becomes more and more efficient, and thus the effective number of workers keeps up with the increasing number of machines (Solow 1956, De Long 1996, Begg et al 2000, Easterly 2001). As suggested above, however, the neoclassical theory left the rate of change in total factor productivity fundamentally unexplained (Pack 1994).

The essence of the endogenous growth theory[6] can be expressed as $Y = AK$, where A still represents factors affecting technical capacity, while K now includes both human and physical capital. In this case, there are no diminishing returns to capital. Investment in physical or human capital leads to an increase in productivity that exceeds the private gain, and sustained growth can then be achieved due to the existence of external economies (Romer 1986, 1990 and 1994, Lucas 1988, Pack 1994, Barro 1991). While some endogenous growth theorists have focussed on the importance of ever increasing human capital in sustaining growth (Lucas 1988), others have concentrated on the quality of machinery or intermediate inputs as a way of offsetting the propensity for diminishing returns (Romer 1990, Grossman and Helpman 1991). But the central issue is that K now also represents the variety and

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[5] The notion of diminishing returns to capital and the relative importance of factor productivity for long-run growth come from Nobel laureate Robert Solow, who published his theory between 1956 and 1957.

[6] First developments of the endogenous growth theory are owed to Paul Romer of Chicago University and go back to the beginning of the 1990's.

quality of inputs; in the endogenous growth theory, different types of investment hold different development potentials.

The concept of endogenous growth rediscovered the notion of positive externalities arising from improvements in economic interaction otherwise underestimated by local economic agents[7] and places great importance on its co-ordination. No firm, acting in isolation, would wish to raise its capital without limit. Since diminishing returns to capital hold at the firm level, economists had always assumed that it held also for the aggregated economy. But when all firms expand together, the economy as a whole may face constant returns to aggregate capital, since capital invested in one firm has the potential to increase the productivity in other firms too – e.g. when communication companies invest in better equipment, other firms can do things that were impossible before. This also applies to human capital – e.g. training by one firm has beneficial externalities for others and the economy as a whole. Individual firms often neglect the fact that, in raising their own capital, they also increase the productivity of others' capital (this phenomenon is regarded as positive externalities from capital accumulation).

A major rationale behind this theory is that the pace of change in total factor productivity is indeed subject to different variables that can be influenced endogenously, for instance, by governments and other local actors (Pack 1996). This brings with it different policy implications. Neoclassical theory provides policy advice that is assumed to be relevant to all economies at all times, based on the fundamental theorems of welfare economics. Simply, they state that perfectly competitive equilibrium is an optimal equilibrium in which it is impossible to make someone better off without making someone else worse off. In other words, competitive equilibrium maximises the sum of producers and consumers' surpluses. Failure to achieve a Pareto equilibrium is called a market failure, and the sources of market failures are assumed to be market imperfections. Hence, the policy advice aims at removing all sources of market failure in the hope that this will move the economy closer to a Pareto optimum (Lipsey, 2000). This has typically been

[7] This has its origins in the late 1800's Marshallian notion of industrial districts.

attempted through top-down approaches to development, characterised by standardised, incentive-based and state-driven elements,

In contrast, the endogenous approach emphasises that, in the real world, the optimal allocation of resources is unachievable[8] and thus the lineal logic of removing impediments to achieving that optimum is not well grounded. Instead, policies should aim at consolidating increases in aggregated factor productivity endogenously. Although the endogenous growth theory does not offer settled directives and a fixed set of policies, it is clear that its axioms contrast sharply with those of the policy orthodoxy, and tends to favour region-specific, bottom-up, long-term and multiple-actor based policy actions[9]. General recommendations frequently include:

- Investment in research and development (R&D) and innovation;
- Great attention is given to the quality of human capital and thus to education and training, as well as the promotion of skilled labour more widely;
- Intensive incorporation of technology, for instance, through trade;
- Intensive support for information flows;
- Creation of local networks and cluster formation;
- Promotion of entrepreneurship;
- Development and consolidation of economic linkages to the local economy

The endogenous approach brings in two concepts of particular importance for local and regional economies under the influence of large mines. First, as suggested earlier, if local actors can influence changes in total factor productivity endogenously, the issue of economic governance and economic institutions must acquire marked importance. However, the failure of highly directed economies recalls the inability of central governments to ensure long-run growth after an initial push from higher investment, and has suggested the need for alternative institutional arrangements.

[8] 'Second Best' theory (Lipsey and Lancaster 1956) argues that when there are many constraints that prevent to achieve a Pareto equilibrium, the removal of any one constraint may affect welfare or efficiency either by raising it, lowering it, or by leaving it unchanged. There is no presumption that removing one market imperfection will raise welfare.

[9] Liepsey (2000) points out, however, that the policy implications flowing from these ideas should be seen both as powerful and risky. Powerful because they suggest a way to go far beyond the generic classical advice, but dangerous because they could easily be used to justify ignoring key market oriented policies and abuse of government interventionism. The extent to which governments should intervene in long-run growth is subject of debate.

Increasingly, policymakers seems to favour the idea that central action should focus on delivering macroeconomic stability, on the one hand, and ensuring further decentralisation and enlarged participation, on the other (Amin and Robins 1990, Oates 1991, Cremer, Estache and Seabright 1996, Hart, Schleifer and Vischny 1997)

Second is the notion that the most advanced forces of capitalism are localised and territorially specific. Geography is no longer conceived solely as a physical support for productive activities but rather a complex and dynamic element of potential economic expansion. The importance of proximity was revived, together with the role of 'trust' in economic transactions, thus promoting the sub-national level to the position of a highly relevant economic factor. Flowing from the endogenous growth theory, these two concepts are foundational to two other approaches in economic development, which are explored in more detail below: the Institutional Economics Theory and the Local Economic Development (LED) initiatives.

1.3. The institutional view

Institutional Economics focuses on understanding the institutional constructs favouring – or otherwise precluding - fluent economic interactions from taking place. Institutional economists emphasise that economic and political activities take place within an institutional framework. Institutions constrain individuals and define the strategies with which they pursue their self-maximising interests in a rational fashion. A dominant branch of Institutional Economics concentrates on the role of transaction costs and the theory of imperfect information, looking at the underlying rationale of institutional arrangements in terms of asymmetric information between the different parties involved in economic transactions (Coase 1960, 1988, Casson 1982, Williamson 1985, North 1990, Milgrom and Roberts 1992). Some theoretical roots for the vast development literature on this can be found in the propositions made by economist John Nash in the early 1950s, in a field known as Strategic Interactions, or The Game Theory (Kreps 1990, Dixit and Nalebuff 1991). Against standard economic analysis, which assumes a single participant (monopoly) or an infinity of them (perfect competition), this is based on transactions involving few participants, for example oligopolies, joint ventures, relationships between one public authority and one firm, relationships between few firms, trade between buyers and sellers etc.

In this context, a ‘game’ is a situation in which one attempts to predict the outcome, based on the information structure (who knows what), the timing (who is acting when), and the payoffs (who is getting what when some action has been played). The main assumption is that of rational behaviour. The best-known example to illustrate this is ‘the prisoners’ dilemma’. In the prisoners’ dilemma, a judge interviews two suspects independently. He has a strong hunch that they have committed a crime but has no hard evidence to prove it. If both deny their involvement, both will receive a light sentence. If both admit their involvement, they will both receive a moderate sentence. If one admits and the other denies guilt, he who confessed will be released whereas the other will be sentenced heavily. The best situation would be for the prisoners to both deny their guilt, but each one knows the other has an incentive to confess, and so they both confess[10]. This situation in which the strategy of player one is the best response to the strategy of player two, and the strategy of player two is the best response to the strategy of player one, is known as the Nash-equilibrium. In the Nash-equilibrium neither has an incentive to deviate. Note that this can lead to inefficiencies.

The conditions change when the ‘games’ are played repeatedly, without certain end. Player one conjectures that player two will co-operate, in order for both to be better off, as long as he/she co-operates. Then, player one can either co-operate or not. This will depend on the expected benefits of each co-operation, assuming this game is perpetuated, against the one-time benefit of defecting. Thus, players may trust each other when the game has no certain end and when the ‘discount rate’ (benefit of each time one co-operates) is not too low. A key rationale emerging from this work is that, under rational behaviour, trust and cooperation among agents will take place when the benefits of future co-operation exceed the short-term gains of non-cooperation. In a real economy, it is also possible to conjecture that one will co-operate with anyone who has co-operated in the past (reputation). The focus is both on frequent

[10] The fact that the suspects are interviewed independently is to say that they play simultaneously, and so they have to ‘guess’ the other player’s move. The interdependence of the payoffs is such that the preferred action of player one depends on what player two does and vice versa.

interactions and also on the circulation of information and social learning. From a policy perspective, promoting co-operation and trust can be achieved either by: a) changing the payoff in the game (through direct action, like taxation), or b) changing the way the game is played (for instance by promoting frequent interactions between the players, changing the information structure through better information flows, etc)

Theorists have subsequently focussed on how these interactions are structured in practice. Ronald Coase (1960) first argued that all economic transactions are costly, even in competitive markets, and thus the most efficient institutional arrangement for carrying out a particular transaction would be the one that minimised its associated costs. Building on Coase, economist Douglas North put forward that institutions significantly affect economic productivity and thereafter long term growth prospects. In his definition, institutions are the basic rules in an economy, and they include both formal systems, such as laws, taxation and market regulations, as well as informal behaviour, such as habits, customs, and ideologies (North 1990, 2001). Flowing from transaction cost theory, Williamson (1985) then explored the rationale underpinning the existence of different types of economic institutions. For instance, producing and enforcing contracts that take into account every possible eventuality is unfeasible, and thus in certain circumstances it makes more sense to internalise transactions within a single legal entity[11] rather than carrying out these commercial operations on the market.

Overall, this field of analysis has provided major insight into the micro-foundations of institutional arrangements in developing countries and in the understanding of underdevelopment as institutional and political failure. A significant number of empirical studies have shown a statistical relationship between economic performance and the quality of institutions and governance structures[12] (Mehlum et al 2002, Sala-I-Martin and Subramanian 2003, Robinson et al 2003, Korhonen 2004, to name just a few). Similarly, for the case of mining, Acemoglu et al (2001) have argued that the differences in income across natural resource abundant countries can be explained by the effectiveness of their institutions. The policy concerns drawn

[11] For instance, by internalising transactions within a firm – i.e. integrating parts of the supply chain
[12] Measures for the quality of institutions and governance structures have typically followed the World Bank's Governance Indicators (Kaufmann and Kraay 2003) or the Database on Political Institutions (Thorsten et al 2001).

from institutional economics have asked which institutional settings are best suited to deliver the most efficient socio economic outcomes. This has prompted a reform agenda that focuses on introducing the 'optimal' institutions as a necessary step to foster economic growth. The bold assumption has been that institutions that have proved efficient in one context will also be appropriate for others.

Yet, institutional economists also underline the possibility of multiple equilibriums as a result of strategic interactions. Historical conditions and cultural beliefs that coordinate agents' expectations influence the selection of a particular equilibrium over another. For instance, Bardhan (2000a, 2000b) notes that institutional economists are unclear about which type of institutional configurations affect the development process and how they do so. Moreover, North (1990) sees political systems and bargaining processes over who bears the costs and who gains the benefits as crucial if societies are to achieve institutional configurations that are conducive to economic growth. Institutions are not simply the result of efforts to lower the transaction costs of market exchange, but are also a function of political and social interests and differences in the allocation of power. Accordingly, Rodrik (2002, 2003) concludes that whilst the quality of institutions is key in advancing economic development, there cannot be a one-size-fits-all answer, and that acquiring good institutions often requires experimentation and the willingness to depart from orthodoxy, paying particular attention to local conditions. North (2001), Bates (2001) and Acemoglu (2003) have argued along similar lines.

Based on the growing understanding of the economic benefits of co-operation and consensus among local actors, institutions at the local and regional level are becoming increasingly recognised as the most adequate for responding effectively and efficiently to global duress regionally. Local and regional institutions have the potential to reduce market failures by facilitating greater access to information, encouraging partnerships, detecting existing or potential clusters and so on because they have the advantage of physical and cultural proximity, and with this, better information. A lack of participation and representation may inhibit the evolution of a dense network of vertical and horizontal channels for interaction, and may also harm trust. Such a lack of trust not only prevents active knowledge sharing and innovation, but also may trigger a need for expensive, time-consuming, contractual transactions (transaction costs). The involvement by the widest range of the social basis in the decision-making process can rebuild the confidence and capability of local actors (for example, Atkinson and Stiglitz 1986, Storper 1997).

In short, the institutional economics approach takes from the endogenous growth theory the notion that the issue of governance is critical in defining long-term economic patterns. In this context, the concept of 'governance' includes governments, but is not confined to them. Vazques Barquero (1999) argues that guiding alert and adaptive economies requires a co-ordinated organisation of local governance. This is not simply a structure of government, rules or regulations, but instead a structure of supported and collective goals agreed upon by a critical mass of those concerned with successful local economic development. In particular at the local and regional level, new institutional arrangements such as partnerships, development agencies, industrial associations, foundations, chambers of commerce, development corporations and so on have the potential to generate innovative spaces for economic interaction, with the active participation of the private and public sectors and the community, as an expanded approach to governance.

The private sector activities can be a lever for the creation of more effective governance structures, which in turn can improve private sector coordination therefore leading to more sustainable economic growth (Pratt and Toterdill 1992, Peck and Tickell 1994, Amin and Thomas 1996). Skrowronek (1982) has noted that various case studies provide rich evidence of how dynamic interactions between different stakeholders in a given institutional and political context have led to the development and adoption of more efficient institutions and governance structures. More specifically, Skrowronek has pointed out that in numerous developed countries the mining sector has featured highly at earlier stages of development for state building processes. Acemoglu et al. (2003) claim that the experiences of the most successful natural resource rich developing countries point in the same direction (Acemoglu et al 2003)

The recent shift in focus back to the local and regional level, however, has unveiled the evidence of various failed stories where the strong initial investment push by large enterprises failed to anchor further economic activity. Of particular interest to this analysis, the local economic development (LED) approach provides a clear way of thinking about the broader interaction of different local economic agents, the potential synergies between large and small enterprises, the consolidation of networks, trust and collaboration, and long term local and regional economic growth. The LED approach first emerged as a spontaneous reaction to local stress due to extensive global changes in the last decades, and has consolidated since as an alternative view to that of the mainstream policy orthodoxy on (regional) economic development.

1.4. Down to the local and regional level

During the last twenty years, deep changes in technology and increasing demand for specialised and differentiated goods facilitated a shift from the old mass system of production to a leaner, more flexible one. This allowed for a greater disassociation of industrial plants and subsidiaries from head offices. This broad reorganisation of the production chain was accompanied by the growing speed of communications and lower costs of transportation. Distances have become irrelevant for many industries. Mining corporations, for instance, have established operations in places previously out of scope, and smelting and refining plants have become divorced from mining, in search of the best economic conditions for each activity – i.e. better skills, access to markets, cheaper energy etc (Radetzki 1994). Better information and greater mobility of capital have also increased the likelihood of some firms to choose new locations according to their risk and cost structure (Porter 1990, Rodriguez Pose 1994, Vazques Barquero 1999)

On the political arena, backed by supra-national organisations like the World Bank and the IMF, central governments have tended to focus on macroeconomic policy – principally aiming at opening the economy to global markets, curving inflation, and reducing fiscal deficits and debt (Williamson 2004). As an illustration, Lipsey (2000) notes that the so-called Washington consensus represented a broad acceptance of the beneficial role played by competition as a defender of the public interest and as a stimulus to growth-creating innovation, which came together with the understanding of the harmful role of monopolies, either in private firms, communications media, government institutions, or state owned industries. These realisations followed the negative experiences of the highly directed economies in the Soviet bloc and the also disappointing results of interventionist models such as the Import Substitution Industrialisation. The ultimate implication was that wealth-creating activities should be located in the private sector, and that governments should concentrate on ensuring that the economic fundamentals to allow for efficient market competition were in place – i.e. well-defined property rights, no arbitrary confiscation of property, security of contracts, etc. As a result, numerous central governments assumed a reduced role regionally, which has in cases supported moves toward increased federalism and political and fiscal decentralisation.

Some commentators have suggested that this increased flexibility of systems of production, together with the ongoing processes of decentralisation can explain, at least partially, a rising numbers of relocating enterprises, which in turn have fuelled competition between territories offering different location-specific advantages. These advantages include the so-called soft factors of economic development – i.e. business environment, entrepreneurship, networks and contacts, and so on-, which constitute region-specific assets in production, and are now identified as a central form of scarcity in contemporary capitalism, and hence a central form of geographical differentiation (Amin 1990, Rodriguez-Pose 1994, Vazquez Barquero 1999, Rodriguez-Pose and Arbix 2001). As a consequence, Amin (1990) has argued that the management of the economic development strategy was, in cases, transferred to the sub-national levels.

Rodriguez-Pose (2002) identifies three main categories for the successful regions engaged in territorial competition: (a) large metropolitan areas, (b) intermediate industrial regions, and (c) tourist regions. However, these areas are hardly the norm. For most regional and local economies, these changes have represented enormous stress for adapting to a new reality under the risk of becoming isolated and being unable to capitalise on the opportunities presented by the new global order. Numerous regions and localities struggle to adapt to these conditions, which in turn have contributed to greater territorial inequalities. Improvements in technology and information technology are also delocalising industrial and agricultural production, while the services sector is frequently related to the evolution of economic activity in other sectors. Thus, the competitive advantage that certain territories enjoyed in the past is being watered down. Many regions without a clear comparative advantage are struggling to even maintain their current market positions. Recently, the policy debate has started to ask whether the fact that territorial specificity has gained relevance represents an overall transfer of manoeuvre capacity to the sub-national level – or does this merely represent a transfer of responsibilities with no empowerment (Amin 1999). Lovering (1999) has argued that the use of geographical arguments can be easily used to legitimise dismantling national re-distributive structures. His argument is that '[…] there is nothing in the structure of the paradigm to guarantee that it will tend to be interpreted in a socially progressive manner' (Lovering 1999, p392)

In any case, the challenges generated by globalisation, together with the failure of traditional top-down policies discussed earlier, led to the re-thinking of practical economic development strategies feeding from the endogenous view on growth and more specifically from the lessons provided by some successful experiences over the last fifteen years, to compile a group of innovative bottom-up development policies which has since become known as Local Economic Development. This may have important connotations for mining, as this new view proposes development models that differ from the old pole of development growth theories based on major companies (as often mining is) and their spill over effects, and places instead greater attention on local organization and management (Amin and Robins 1990, Rodriguez-Pose 1994, Vazquez Barquero 1990, 1999, Rodriguez-Pose and Arbix 2001). LED strategies are defined by their key characteristics, often presented as contrast to traditional top-down development policies. Rodriguez-Pose (2002) summarises the main differences between these two approaches to development in five main domains, presented in table 1.1.

Table 1.1 - Traditional top-down policies and bottom-up LED approaches

Source: Rodriguez-Pose 2002

Traditional Development Policies	Local Economic Development
1. Top-down approach in which decisions about the areas where intervention is needed are taken in the centre	1. Promotion of development in all territories with the initiative often coming from below
2. Managed by the central administration	2. Decentralised, vertical cooperation between different tiers of government and horizontal cooperation between public and private bodies
3. Sectoral approach to development	3. Territorial approach to development (locality, *mileau*)
4. Development of large industrial projects to stimulate other economic activity	4. Maximising the development potential of each area to stimulate a progressive adjustment of the local economic system to the changing economic environment
5. Financial support, incentives and subsidies as the main factor attracting economic activity	5. Provision of key conditions for the development of economic activity

In this view, long-term economic growth can be based on any type of economic activity (primary, secondary or services) as long as the productive units reach high competitive market standards. Essentially, while production becomes increasingly flexible, productive units can be effectively organised in various different forms which, in turn, explain different outcomes. In effect, the local development literature has recently highlighted successful regional growth experiences going from highly specialised clusters (e.g. Silicon Valley, *Cité Scientifique* of Paris etc) or systems of vertical and horizontal integration based on large companies and linked suppliers (e.g. the German car industry in Baden Wurttemberg etc); to the flexible specialisation of the furniture and textile small-business-based industry in Emilia Romagna, Italy, or the bottom-up associative development in rural Spain (Best 1989, Amin & Robins 1990, Geddes 1992, Cooke and Morgan 1994, Rodriguez-Pose 1994)

1.4.1 Large firms and local economic development

The predominance of the growth pole model of development during the 1960s and 1970s represents a good illustration of the importance attributed to large firms in the classical (exogenous) approach to regional development. The concept behind this is that attracting one key, large company to a deprived area would generate a cascade effect on the surrounding enterprises and broader economy, which would benefit from a trickle down effect through transmission channels such as the redistribution of taxation, the supply chain, increases in human capital and so on (Perroux 1955, 1988). Pinpointing key sectors and firms, and attracting them into the region became the main strategy for regional development. In doing this, policies relied on the use of territorial incentives, such as export processing zones, subsidies, direct investment in infrastructure, and even on direct investment by public companies.

Overall outcomes were disappointing. It was discussed earlier that exogenous growth policies often failed to deliver sustained growth after an initial push from new investment. Typically, the old pole growth model promoted limited interaction between large companies and local supplies; local outsourcing remained sparse or concentrated in basic services, and local agents remained distant from strategic decisions. There has frequently been little investment on research and development locally and thus the supply of new techniques and technology has largely been imported into the regions in a systematic basis (Vazquez Barquero 1999). All these leakages tended to limit the start up and growth of local small and medium enterprises. The full local economic development potential was rarely captured.

The LED view argues that the increasing flexibility in the production systems favours a greater integration between the subsidiaries of large corporations and the local productive structure. Rather than breaking from, LED initiatives tend to build on the old growth pole strategy. When there is evidence of convergence between the localisation strategies of large companies and the economic development strategies by local governments, results frequently lead to large synergies that have the potential to improve local competitiveness greatly (Vazquez Barquero 1999). According to Vazquez Barquero, the local economic development dynamic could, in effect, be conceptualised as the interaction between the development strategies by regions and those by the firms. The LED view is that there are two convergent and complementary elements in the development process: first, the firm becomes a catalyser of economic development. Attracted by local and regional characteristics, it contributes its innovation capacity, its technology, and its managerial ability, improving the organisation and the learning dynamic locally. In turn, the local development strategy triggers the potential for endogenous growth latent within the region. In these circumstances, there is large possibility for the nurturing of synergies between the firm and the region.

This new approach has been facilitated by the tendency that large corporations have had, over the last few decades, to increase in size and improve their organisation, driven less by cost cutting practices than by the need to improve the efficiency of their production, procurement and transport systems, in order to gain global competitiveness (Porter 1990). New flexible systems of production, together with technological and managerial changes, allowed these global firms to reduce transaction costs significantly and benefit from expanded economies of scale. Porter argues that these companies have increasingly become more flexible organisation, and have adopted strategies to benefit from more fluid relationships between different units in the firm; among the firm, its contractors and clients; and thus, from closer links with local enterprises and institutions. Some firms also started to look for potential sources of competitive advantages in the territoriality. Amin and Tomaney (1997) suggest that from the 1980s an increasing number of networks of increasingly independent subsidiaries have become more integrated with the territories in which they operate. While cost cutting practices continue to guide the strategy of some companies, in many cases, strengthening their relationship with local enterprises and institutions have become a foundational objective of corporate strategy. Moreover; in some situations, these relationships can favour the formation of industrial clusters and generate economies of agglomeration, structure the territory, and confer enormous advantages to the firms choosing to operate in these locations (Storper 1997)

How does mining fit into this scheme? Storper (1997) makes a clear distinction between regions and localities with specific resources that can be attractive to global companies, and those without them. Likewise, he distinguishes between economic activities that are highly territorialized and those that are not. Territorialized economic development is based on activities that depend on the specific resources existing in one place, like manufactures with high technological content, or differentiated goods that target a very specific sector of the market, like high end consumer goods. Storper focuses his analysis on how to make production more efficient as a result of proximity and market interactions, for instance, through innovative organisation structures that can be ingrained in the local productive system. However, he also includes as territorialized economic growth those activities, like mining, requiring more tangible assets and based on more direct comparative advantages – i.e. the existence of an economically viable ore body.

In sum, Vazquez Barquero (1999) concludes that when the strategies of large firms and those of regions are able to converge, this can ignite a process of endogenous local economic development. In his view, the most sophisticated elements of the old growth-pole strategy could be recuperated and reconsidered within a different context. It is possible to think of an integrated planning process capable of coordinating the specific strategic objectives of both large firms and regions, which would demand the definition of precise mechanisms for design, implementation, control and evaluation. While the largest capacity for job creation and dynamism in the economy would be determined by the level of interlinked systems of small and medium enterprises, large firms have the potential, under the circumstances discussed here, to trigger a process of sustainable economic development. Finally, depending on the specific technical and institutional relationships established between the different firms and the local productive system the resulting level of synergies and forms of cooperation would vary significantly. This, in turn, would determine different dynamics of local economic development.

1.5. Bringing mining back in: large mines and the region

The beginning of this chapter noted that the Resource Curse Theory has concentrated more fiercely on the macroeconomic elements of the debate in order to explain the supposedly negative correlation between mineral rich economies and economic growth (Auty 1993, 1997, Sachs and Warner 1995, 1999, 1999b). Numerous studies have since questioned the grounds for these allegations and insisted that the propositions put forward by the RCT are still an open debate (for instance, Hadass and Williamson 2001, Lederman and Maloney 2002). Some consensus has started to build, however, based on the recognition that many mining economies have dodged the threats allegedly posed by the exploitation of mineral resources; have obtained significant benefits from it; and have since triggered long-term processes of economic development (Davis 1998, Eggert 2001, World Bank 2002, Davis and Tilton 2002). It has also been recognised that, when this happened, strong governance structures have often underpinned the process. The policy question starting to consolidate is not if, but rather under which circumstances is mining beneficial – or detrimental- to economic development.

This, together with a revival of territoriality as a determinant of economic development has favoured a shift in focus towards the regional and local economic aspects of mining (e.g. local sourcing and labour, the contribution of mineral revenues to local administrations etc), which has, in turn, put larger mining companies on the spot. More broadly, economic development theory has also redirected attention to the sub-national levels. In this sense, Vazquez Barquero (1999) argues that the most successful experiences of local economic development are usually structured around three pillars: 1) infrastructure, or the most tangible elements of economic development, 2) the intangible elements of economic development, and 3) governance and the organisation of the development process.

The first pillar involves many elements common to the exogenous, top-down approach to regional economic development, such as the provision of regional infrastructure. In the neo-classic approach, lack of infrastructure precludes economic interaction and competition and thus is understood as a market imperfection that needs fixing. In this sense, the old pole of development growth theory also saw in the provision of infrastructure a draw for large companies into a region (Perroux 1955, 1988), and so a cost-benefit analysis would eventually determine whether the expected level of private investment justifies the expenditure, often undertaken by the central administration. Initiatives in this respect include the construction of buildings such as schools, hospitals or business centres, transport infrastructure, communications systems and so on. Instead, the new views on growth subordinate the provision of infrastructure to a pre-existing wide-ranging regional economic strategy.

For this reason, the second pillar implies the consolidation of a comprehensive mid and long-term economic development plan. The objective here is to define and implement a strategy to enable the region to fulfil its economic potential, making full utilisation of its comparative advantages, and overcoming its main restrictions to economic growth. According to Rodriguez-Pose (2002), these strategies are typically articulated around four areas: (a) the competitiveness of local firms, (b) the attraction of inward investment, (c) the upgrading of human capital or labour skills, and (d) the provision of more specific infrastructure. Critically, these strategies should not be perceived as a compilation of single responses to these different areas, but a balanced and comprehensive plan that enables the economic activity to root in the territory. Efforts in one area need to be matched by the others. Training programs, inward investment strategies, specific infrastructure and business support ought to be synchronised and planned jointly.

Finally, this process not only needs to identify key comparative and competitive advantages, and to reflect these in sound mid- and long-term strategies, but it is also essential that this strategy be implemented into action and the many elements involved be coordinated into the process. The third pillar refers to the organisation (institutionalisation) of economic development. The public sector is not always the best-suited actor to fulfil this role. The development of a territory is organised through the individual decisions taken by public and private agents. Successful interventions can only be achieved by the systematic involvement of a representative number of local actors. Vazquez Barquero acknowledges that some key players often catalyse the emergence of regional economic policies, but he also argues that it is essential that these policies count with the explicit or implicit support of, and be appropriated by, the majority of the local society (Vazquez Barquero 1999).

Can large mines contribute to this threefold approach? In contrast to most other industries, the quintessence of the localisation strategy of mining companies is the presence of an economically feasible ore body. While mining benefits largely from the existence of good infrastructure; the proximity of well-developed suppliers; a high-skilled labour force; and strong local governance, the first determinant of investment is the existence and quality of the underground commodity. World-class ore bodies are increasingly found in remote and isolated areas, often served by poor infrastructure and usually far from urban districts. All too often basic economic fundamentals are not in place; local markets lack the critical scale for businesses to flourish, commercial credit is repressed, and qualified human capital is in poor supply (e.g. Citigroup 2006). These are difficult conditions for development. What are the opportunities and challenges that mining brings with it in these dire circumstances?

1. A large sized mine mobilises millions of tonnes of rock annually, which almost inevitably needs to go through basic processing to extract the economically useful ore, which is ultimately transported to the markets or to industrial plants for further transformation (Crawson 1998). Although the importance and scale of the transport infrastructure in a mining operation depends on the commodity – i.e. the value per tonne of industrial minerals tends to be much smaller than that of, say, precious metals or diamonds-, it is an intrinsic element in the mining industry and, in many cases, its engineering is far more complicated and sophisticated than that required to separate the ore from the rock. Companies need to ensure that this infrastructure is in place ahead of inception, and large disbursements are often contemplated for this. In general, this includes the provision of roads, rail and/or ports. In order to operate, mining also needs to ensure the provision of power, potable water, sewage systems, communication, and often too local clinics and training centres. While the industry has generally devised and executed this investment driven by its specific technical requirements, it would also be possible to plan this infrastructure to accommodate economic requisites more broadly and thus help maximise the local economic potential (MMSD 2002). This would demand conducting comprehensive diagnoses and producing regional economic plans prior to the investment.

2. A refocus on the regional dimension calls for exploring the industry's potential to anchor business activities in the local environment, and thus its capacity to generate wealth over the long term. However, some commentators have noted that the development agenda of regional mining economies is palpably divided into elements that have always been, to greater or lesser extent, within the industry's mandate and area of expertise (i.e. those related to the companies' inputs into

production), and those elements beyond this boundary, but without which the endogenous virtuous cycle proposed by the LED approach cannot be achieved (for example, small and medium enterprise development outside the mining supply-chain, the effectiveness of the local financial sector, etc) Economic diversification, as a means of avoiding dependence on mining, requires addressing issues of economic restructuring more broadly (Di Boscio 2004, ICMM 2006). For instance, the absence of balanced and comprehensive development strategies may put too much emphasis on the direct investment from mining and thus increase the dependence of an area on external players. Similarly, concentrating efforts on training activities by a firm without improving the local business environment may lead to a mismatch between the supply and demand of the labour force within the local economy.

3. Does mining have intrinsically limited potential to promote economic development at the regional level, or are negative experiences a result of local economic governance and institutional failure? Mining often operates in very difficult environments for economic development, where governments are often under-funded and civil society is disorganised or lacking the necessary skills and managerial capabilities to put forward and consolidate new structures of governance more conductive to growth (ODI 2006). In these places, large mining companies are frequently the single most important economic agent, and regularly too the most cohesive institutional organisation in place. The question remains whether these enterprises can legitimately contribute to the formation of local institutional arrangements that are capable of defining a broader strategy for the local economy and lead the development process without infringing on governments' sovereignty or undermining the industry's capacity to maximise the mineral rent available for distribution.

While there appears to be numerous mutual benefits from greater institutional coordination between large mines, civil society and local and regional governments, synergies may not simply materialise (Di Boscio and Humphreys 2002). Davis (1998) notes that too often, governments prefer to operate as a patron and dispenser of favours rather than an organiser of productive synergies. Similarly, mining companies have historically tended to respond to community pressures in a way that follows the strategies of central governments, and have often been involved in the direct provision of services like education and health, direct monetary transfers in the form of donations, or sometimes through decentralised institutions such as foundations. More recently, as the mining industry embraced sustainable development, companies have established a new set of priorities and redirected their efforts to identify and mitigate social and environmental costs, and endeavoured to maximise the local economic spin-offs from their activities. Accordingly, most large mining firms in the industry now produce regular social and environmental reports of mixed quality, covering policy approaches, targets and performance in aspects as diverse as safety, environment, water utilisation, energy use and greenhouse gas emissions, waste management, communities and, more recently, economic contributions flowing from their operations (for instance, websites of Anglo American, BHP Billiton, Placer Dome; Rio Tinto 2005).

The first reactions to these initiatives were varied. Many still saw these responses as an overall distraction from the core mandate of these companies (i.e. the maximisation of shareholder value), on the one hand, or as merely reactive to Corporate Social Responsibility pressures, and largely philanthropic and thus short lived, on the other. In the socioeconomic arena, these contrasting views have been fuelled by a poor understanding of the situation on the ground. While the industry has increasingly endeavoured to capture and communicate direct economic benefits from the mines, as well as the efforts by corporations in these regards (Prescott 2009), there have only been sporadic attempts to understand the actual effect of these corporate initiatives on the local economies (e.g. McMahon and Remy 2001, IESR 2002, Khumalo et al 2002, ICMM 2006) – and no rigorous work linking the lessons from modern growth theory to the long-term management of local mineral wealth. Essentially, while the early responses put in place by large mining companies have recognised some of the negative connotations of their investments, they had typically paid little attention to the complexity and long-term implications for local economic development discussed above.

Feeding from modern growth literature, however, an emerging approach has started to envision the modern mining sector as a catalyser of local and regional development, conceiving large mines as agents of change and capacity building

(Humphreys 2002, Walker and Jourdan 2003, ICMM 2003, 2006). To test this proposition is, in effect, the aim of this research. In doing so, this work has put forward two main hypotheses: first, that large mining enterprises can indeed help achieve this, on the one hand, by maximising the most direct contributions from mining activities (including the provision of mining infrastructure, as well as the optimisation of the local supply chain, direct and indirect employment, vocational training, and so on), and on the other hand, by capitalising on the industry's potential to mobilise other economic agents and to leverage expertise and capital from third parties (e.g. governments, civil society, private agents, international organisations etc) thus contributing to consolidating a stronger institutional foundation locally. The second hypothesis, however, suggests that this affirmative vision will hardly materialise by default, and that proactive economic management would thus be required from a broad spectrum of economic players. In moving the investigation forward, the next chapter reverts to the critical features of the mining industry and to the emergence of the sustainable development movement.

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Chapter 2

Mining and its contribution to development over time

2.1. Localisation of mining companies and the concept of soft sustainability

Why does mining take place where it does? Perhaps the key difference in the location strategy of this industry, as opposed to most of the other industries, is that mining will only occur in places where mineral deposits are found. These deposits are not evenly distributed throughout the world, and even when some deposits are naturally clustered by regions[13], they are not very frequently economically exploitable with the current technology. As these deposits are immobile, it is the mining inputs that have to move where the ore body is. There are also other determinants of localisation in the mining industry. Out of two deposits of identical characteristics, whether one deposit is developed into a mine would depend on various other factors (Eggert 2001). One of these factors is access to, and cost of, inputs of production, including tangible elements such as land, labour and capital. Mining is frequently an energy intensive industry, and thus power is generally a critical input. Depending on the operation, water and supplies such as mechanical parts, chemicals and gases are also of significant importance. In addition, intangibles such as risks of expropriation and political and social turmoil are of decisive importance for large and long-life mines.

A key element in evaluating the viability of mining is also the availability and cost of transport infrastructure – usually including harbours, roads, railroads and airports - to allow for the transportation of inputs into the mine, as well as the mining production to the markets. Many large mining ventures have to consider the construction of heavy infrastructure into their financial analysis, although the up-front cost of this expenditure can jeopardise the profitability of projects altogether. The total cost of transportation is generally seen as a function of distance; for a remote deposit to be developed it has to have better geological characteristics than any less-remote alternative; in essence, remote deposits should have sufficiently low unit costs of production to offset the penalty paid in the form of higher transportation costs. The way in which distance to markets has influenced mineral economies has changed over time and will be explored in detail later in this chapter.

[13] For instance, a relatively small country like Chile accounts for around 35% of the world production of copper. In turn, this production is concentrated in a relatively small area in a northern region of the country (Antofagasta).

Eggert (2001) also identifies agglomeration economies as a potential factor influencing the location of mining activity. There are cost savings to individual firms that result from being located close to other similar enterprises (Marshall 1920, Krugman 1991). Any type of agglomeration economy is a pooled market for workers with specialised skills. In an increasingly specialised industry like mining, firms benefit from having a larger pool of potential workers to choose from, while workers benefit from having the opportunity to change jobs within the same location. As information flows more easily locally than over large distances, technological (or knowledge) spillovers constitute another agglomeration economy (Krugman 1991). Mining companies benefit from the knowledge spillages from competitors located nearby. A further agglomeration economy is greater availability of specialised intermediate inputs. A mining cluster can support the development of specialised supplies, from large, heavy, and sophisticated equipment, to a flexible system of services to mining.

Of course, there are also historical reasons helping determine the location of big mines (Krugman 1985). Indeed, the relative influence of all these factors on the investment decisions by mining companies has changed over time, and it is substantially different today than it has been throughout the twentieth century. Closer examination, in fact, shows how mining itself has transformed its system of production dramatically, following changes in technology, the global system of industrial production, the global balance between demand and supply of minerals and metals and, more recently, the revolution in communication systems (Radetzki 1982, 1994). Furthermore, the ways in which these investments have impacted on economic development have changed as well, and the emerging patterns of development evidenced in mineral economies appear to be widely disparate. More generally, however, both industry and governments have been increasingly promoting the sustainable development (SD) model as the new policy panacea for these regions. While the SD model started to influence the mining industry more notably towards the end of the 1990s, most assessments so far have been carried out by either the industry (Anglo American, 2005; BHPB, 2005; Rio Tinto, 2005 etc) or activist NGOs (Ross, 2001; FoE, undated, to name just a few)

SD had been around for some time before that, but was rarely applied to the mining industry. The concept of SD was actually born as response to the international concern over the exhaustion of natural resources and the negative impact of development on the environment. The 1972 Conference on the Human Environment (UNEP 1972) first called for an international effort to preserve non-renewable resources from their exhaustion for the benefit of future generations. However, the idea of constraining development raised concerns too, particularly when applied to developing nations. The World Commission on Environment and Development addressed this tension between different interests and defined SD as development that '[…] *meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987, p43).* The joining of development and environment was further crystallised in the UN Conference on the Environment in Rio de Janeiro in 1992, which reflected the interests of developing economies by reaffirming the principle of the sovereign right of countries to develop and exploit their own natural resources and by declaring the eradication of poverty as an indispensable requirement for SD (UNCED 1992).

This dichotomy between the preservation of the environment and economic development led to the distinction between 'hard' and 'soft' sustainability. In essence, the two approaches weigh the scarcity of natural capital in different ways (Van Pelt et al 1995). While the former rejects the concept of substitutability of human activity for natural capital, the latter accepts it to some extent. The proponents of hard sustainability believe that the limiting element for development is not man-made capital but rather the continuing existence of natural capital. The concept of soft sustainability, instead, accepts the view that man-made and natural capital can, in cases, be substitutes (Costanza 1991, Braat and Steelkamp 1991, Becker 1997). For instance, this view would accept that the depletion of a mineral deposit can be legitimately sustainable if this natural capital is properly transformed into other forms of capital that can generate long term sources of wealth. This is mostly the conception of sustainability adopted by the mining industry (Davis 2000, Humphreys 2000, 2000b) – interpretation that is frequently referred to in this research.

For the purpose of this work, in fact, the definition of sustainability is narrowed down to the notion of pure *economic* sustainability. Environmental concerns, therefore, have been excluded from this analysis[14]. More specifically, an independent attempt to review the regional economic implications of this stance on SD would need to build simultaneously upon (a) an objective perspective of the singular characteristics of today's mining and (b) a deep understanding of the economies in which mining takes place. The central subject of analysis of this chapter is the first of these two focus areas: the mining industry, in particular the distinctive characteristics of its contributions to, and effects on, sub-national economies over time. This examination is carried out in two parts. Section 2 starts with an overview of how to think about the economic effects of any economic activity, with a focus on the mining industry. It also discusses the concept of economic rent, crucial to the understanding of the industry's contribution to development and the extent to which this can be sustained over time. These basic concepts are applied to specific mining operations in later chapters. Section 3 examines the three main paradigms for post-industrial development in the mineral sector, and reviews the differentiated roles played by mining in regional development, and how these changed over time.

2.2. Identifying the economic contribution of mining companies

A common approach to understanding the full economic impact of a company is to look at its total revenue, which is made up of value added and bought-in factors. While this is appropriate at the company level, summing up total revenues across different industries in a national economy will inevitably count some outputs more than once – for instance, the bauxite that goes into alumina, the alumina that goes into aluminium, the aluminium that goes into a radiator, the radiator that goes into a car. For this reason, any economic activity is more accurately measured in terms of its value added. In an economic context, the value added by a firm refers to the difference between its total revenue and the cost of bought-in materials, services and components (also referred to as payments to suppliers). It therefore represents a measure of the value which a firm has 'added' to these bought-in factors. Equally, value added can also be calculated as the sum of all labour payments, the taxes and

[14] While this approach facilitated the exploration of the economic rationale behind mining policies based on principles of economic sustainability, results from this work should only be seen in the light of this narrow interpretation of SD. It should be acknowledged, therefore, that this definition reflects a limited interpretation of an otherwise complex concept.

royalties disbursed to governments and others, plus all returns to capital – including interest payments, profits paid out to shareholders, as well as money retained in the business for future investment and to replace depreciated assets. The sum of value added across all public and private enterprises in a country should equal the widely recognised measure of an economy's size, its Gross Domestic Product (GDP)[15, 16] (Begg et al 2000, De Grauwe & Camerman 2002).

Modern mining is a high value added sector, which means that each mineworker adds larger amounts of value than the employees of most other industries, notably manufacturing (conversely, high value added sectors are those requiring a relatively low value of supplies to operate). In some high value added industries, value added per worker is greater because inputs such as capital or skills are particularly prominent. In the case of mining, this is primarily because of the intensity of capital required to operate – for capital intensive industries to earn a normal return on large investments, they must charge prices that are larger in relation to labour costs than labour intensive industries (Krugman 1995, De Grauwe and Camerman 2002). Annually, this capital intensity is reflected in items such as the interest payments for money previously borrowed, repayments to shareholders for their provision of capital, and money retained in the business to finance future investments and to allow for the replacement of depreciated assets.

Although not included in the calculation of value added, payments to suppliers (i.e. materials, facilities and services purchased by a company) constitute a strong

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[15] Summing up value added across all enterprises in a country should equal GDP, or Gross National Product (GNP) when coverage is extended to include cross-border transactions.

[16] Value added can be calculated either by adding together individual elements of value added as they are distributed or by subtracting relevant costs from total revenues. The main conceptual issue in the calculation of value added is where to include depreciation. If depreciation is included in the estimate of value added this gives 'gross value added'. This does not include an adjustment for the consumption of fixed capital but the estimated figure is then comparable to GDP/GNP data. If depreciation is excluded this gives 'net value added'. This is possibly a truer indication of the actual economic value of economic activity, but it is comparable to net national product rather than the more widely understood and used GDP/GNP.

A secondary complication can occur due to the impact of taxes and subsidies on input prices and revenue. These distortions can affect the calculation of the true value added. Aggregate GDP/GNP can be simply adjusted from a 'market price' basis to a 'factor cost' basis by deducting total taxes on expenditure and adding in subsidies. However, at the firm level, where the interaction between expenditure taxes, subsidies and input and product costs is more complex – and depends upon the way in which payments are allocated in the company accounts – it is more difficult to make such an adjustment and it is not generally attempted.

additional benefit to the economy, generating employment and creating wealth in other sectors. The level of sourcing (payments to suppliers) from within a given economy is the most commonly used proxy for backward linkages (UN 2001). In other words, the higher the participation of intermediate consumption in total output, the higher the potential to develop linkages to the economy. Backward linkages are of particular significance to developing economies because they provide opportunities for production and employment by domestic suppliers in the small enterprise sector – believed to be a key player in economic development (for instance, Teitz 1987). More importantly, they constitute a direct channel for knowledge diffusion that can assist in upgrading domestic suppliers, with spillover effects to the rest of the economy. Such knowledge diffusion is especially important for domestic firms that have to catch up with internationally competitive practices. These are frequently referred to as indirect contributions from economic activity.

It is generally easier to source externally when the technology is divisible into separate stages and services than when it is a continuous process. The manufacturing sector has a broad range of linkage-intensive activities, though there are still large variations by industry. Large scale food processing involves high ratios of intermediate inputs to total production and extensive backward linkages between foreign affiliates and domestic suppliers of raw and packaging materials. In contrast, textiles and clothing show relatively weak linkages, since the textile industry needs considerable sophistication and scale to provide the variety and quality of fabrics needed by large companies (UN 2001). In the primary commodities sector, however, the scope for linkages between large companies and local suppliers is often limited, as production processes tend to be continuous. This has led some to argue that, for local and regional economies, linkage promoter sectors (i.e. some manufacturing industries) are a better development choice than mining (Ross 2001).

High levels of intermediate consumption, however, do not necessarily mean more linkages locally. A firm in any location has three options for obtaining inputs. It can purchase them from local suppliers, produce them in-house, or import them from another region or country. Sourcing locally depends on the cost, quality, reliability and flexibility of local suppliers relative to the other alternatives. Proximity does matter in all sourcing choices. Being near suppliers can make procurement more flexible and easier to manage and monitor and may be essential where much information is required for efficiency. Where the input is a constantly used service, again, it is likely to be more efficient to have the provider nearby. An efficient network of suppliers allows companies to reduce the risk of disruptions in input supply and to adjust capacity utilisation more readily to market conditions. Trust, which plays an important role in all transactions, is easier to develop with face-to-face interaction (UN 2001; Di Boscio and Humphreys 2004).

Conversely, there are also costs with buying locally. Local external suppliers have to be identified, negotiated with, and, most likely, upgraded and closely monitored. Often, multinational corporations find it more efficient and convenient to import inputs from well-established sources elsewhere rather than to buy locally or to organise their own production. In particular, where technical requirements are rigorous, as in specialised manufacturing or complex machinery, the availability of good quality local subcontractors in developing regions will tend to be limited. Davis (1998) argues that the drivers of comparative advantage in mining are not necessarily the drivers of comparative advantages in other sectors. Success in manufacturing generally requires local suppliers, access to markets, educated workforces, good infrastructure etc, conditions that most developing regions lack.

In mining, the forward linkage is much more extended than the backward, as the sector is at the beginning of the productive chain. The products from the mine commonly have to undergo several transformations before final consumption, including smelting, refining and fabricating, which can constitute an important further contribution to the economy. Forward linkages to the local and regional economy, however, also carry the risk of becoming value-subtracting activities (i.e. low productivity, need for subsidies, etc) if they are not driven by genuine comparative advantage. Nowadays, the steady decline in transport and communication costs made it possible to move raw materials over long distances to the most competitive centres for processing (Radetzki 1994). Once again, what makes for comparative advantage in minerals extraction is not necessarily the same as in the smelting and refining of minerals, and so regions rich in mineral resources that succeed in attracting mining companies may well fall short of the conditions to attract the investment necessary to benefit from forward linkages.

The full economic benefit of mining, (as well as any economic activity), is frequently larger than the calculation of its direct and indirect contributions once secondary, or 'multiplier', effects on the rest of the economy are considered. These provide an idea of the gross economic activity generated by any given sector and, as such, are commonly used to measure the size of linkages. Essentially, multipliers reflect direct and indirect gains from the activities of suppliers, and the economic activity induced by workers spending their wages, as well as that occurring from the circulation of taxes and profits. In effect, they are measures of the impact on the aggregate economy per unit increase in the sector, whether this unit increase is in income, output or employment (Davis 1990; Begg et all 2000). However, multipliers only provide a relative estimate. If total output value in a sector is large enough (as often happens with mining), a sector with a smaller multiplier can have a much bigger net effect on the region than a sector with a larger multiplier and smaller output value. The evidence suggests, however, that there are no common multipliers for any given industry, and that multipliers are highly regionally specific (McMahon and Remy, 2002).

Later chapters apply these concepts in practice. Yet, there are also wider effects to think about when considering the economic impact of mining. Positive spin-offs include the generation of employment, investment spending, the provision of infrastructure, and training and education. In addition to the direct taxes, governments also generate an income stream through payroll and indirect taxes on purchased inputs as well as taxes related to the activities of suppliers, consumption taxes raised when employees spend their wages and from the further taxation of economic activity indirectly dependent on a firm's operation. The spread of skills and knowledge can be of particular social importance for regions that would otherwise experience underemployment. At the national level there is also a positive impact from the production and export of raw materials on the balance of payments account, allowing the importation and consumption of foreign goods and services. The point was made earlier that the focus of this research is the economic effect of mining at the local and regional level. It is worth noting, however, that the industry has been blamed for having a damaging effect in the political and environmental arenas, and thus these should also be considered when looking at the all-encompassing impact of mining.

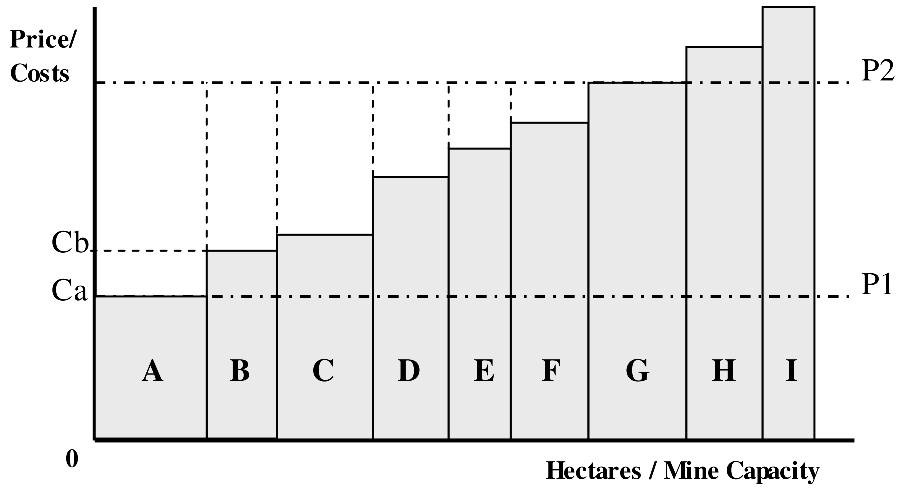
2.2.1 Economic rent

The concept of economic surplus, or rent, is crucial to the understanding of mining contributions to economic development (in particular to government revenues) and the extent to which this can be sustained in time. It is also critical for assessing the economic impact of single mines, and it is thus referred to later on in this research. Economic rent is just a technical economic concept, and differs from both value added and profit. As discussed above, the former is a measure of the contribution of any economic activity to GDP, and is in essence the reward to all factors of production, (land, labour and capital). Profit is instead the reward to one factor of production in particular, capital, and is therefore part of value added. Economic rent is that portion of value added that exceeds the costs of all factors of production (Crowson 2003)

David Ricardo was one of the first economists to apply the concept of rent, back in the early 19th century. He pointed out that agricultural land could be separated into different classes according to its fertility. To better understand this, it is useful to look at it graphically, as shown in figure 2.1. The best land, represented by rectangle A, can produce food at the lowest cost (OCa). The next best parcel (rectangle B), has somewhat higher costs (OCb) and so on. When the population is small, all of the best land exceeds the demand for it; the price of food (P1) equals its production costs (OCa); and landowners receive no rent.

Figure 2.1 – Economic Rent

Source: Tilton 2004



As population and the demand for food expand, eventually all the best land is cultivated, and it becomes necessary for producers to start using land with lower fertility. This causes the production cost, and in turn, the price of food, to rise. When the land of quality G is needed to feed the increases in population, the cost of producing food on this land raises its price to P2, as shown in the graph above. Farmers at this price are willing to pay the owners of better land a rent, often referred to as Ricardian rent, which price depends on the gap between the market price and the production cost. In figure 2.1, this is the rectangle that extends from the production costs for each type of land to the market price (Tilton 2004).

Like parcels of land, mineral deposits have different quality and different production costs. It is thus easy to imagine that the diverse classes of land in figure 2.1 can also portray different mines, while the horizontal axis can measure mine capacity rather than hectares of agricultural land. Mine A has the lowest production costs, thanks to its rich ore body and other factors. Mine B has the next lowest production costs, and so on. The area for each mine under the price line and above its costs reflects its Ricardian rent. Both the quality of mineral deposits and the efficiency with which any operation exploits them vary widely, even within single countries. Therefore, while mineral prices fluctuate in step with changes in the balance between demand and supply, the profitability of different mines also varies widely at any given product price (Tilton 2004).

In fact, economic rent will accrue over the lifetime of a worked ore deposit, until all the economically usable ore has been extracted. For long-lived mines, annual rents often accrue unevenly between different generations. For instance, after mining and processing have finished, good practice determines that costs will be incurred in rehabilitating the site and restoring it for other uses. These costs should also be properly included with all other costs of working the property before the calculation of any economic rent. The changing incidence of rent over time means that all calculations of its magnitude are more accurately made in terms of net present values (NPV), using an appropriate discount rate. Some mines will never create economic rent – and may not even cover all their costs of production -; others, in contrast, may generate a large rent. Some mines are highly profitable throughout their lives; others will always be marginal. The growth of demand in minerals and metals, and hence the need for new mines, will be affected by the changing pace and locality of economic activity, changes in technology, governmental regulation and so on. As the techniques to explore, mine, extract and process minerals and metals improve, previously marginal deposits may also become more profitable (Crawson 1998).

In short, the calculation of mineral rent is not independent of prevailing conditions. Ore bodies are worthless until they are discovered. Their full value can only be realised when mines and processing plants have been developed to exploit them. Just as the technical and managerial capabilities of mining companies can vary widely, so can their capacities to maximise the potential rent from individual ore deposits. Incompetent management can dissipate rent, as can inappropriate government policies towards mining (Crawson 1998, Eggert 2001). Thus, the opportunity cost for each project will vary from each prospective investor, as different investors will require different risk premiums in different places, determined by their risk perceptions about the host country over the longer term. All this means that rents, as the residual after all necessary costs (including a required return on capital) will be partly subjectively determined. Also, any estimate will always carry a wide, and probably fluctuating, margin of error. In this sense, an arbitrary upfront distribution of the rent generated by a mineral enterprise can also put at risk the creation of that rent altogether (Peck, Landsberg and Tilton 1992).

2.2.1.1 Optimal allocation of the economic rent

Economic rent is the surplus from which governments can raise revenues through taxes, over and above those which are treated as the normal costs of doing business. Hence, there is a twofold risk that governments fail to capture a large enough proportion of the mineral rent, on the one hand, and that governments attempt to capture a larger proportion of the rent that is optimal, on the other. In a cyclical business, if all rents are taxed away when prices are high, without allowances for losses incurred when prices are low, investors' rates of return could drop below their opportunity costs of capital. New investment will be discouraged, not only in new projects, but also in sustaining capital to maximise future value added from existing operations as well. Hence, national tax policies greatly influence the mining industry's long term global sustainability. Crowson (2003) argues that tax rates need to leave mine operators with a sufficient share of economic rent when times are good to compensate, at least partially, for the bad times. Efficient tax policy for the mineral sector should be primarily concerned with ensuring that potential economic rents are realised, and then that the bulk of them are captured through taxation without affecting negatively on future rent generation. Mining theorist have thus argued that the focus of public policy should be on maximising the net present value of the social benefits from the mineral sector over time – or the stream of revenues flowing from it, if the focus is on government receipts (Otto 2002, Tilton 2004).

Flowing from this debate is the discussion regarding the broader distribution of benefits from mineral developments. Until now, the prevalent view has been that defining the optimal allocation of economic rent is primarily a government mandate, which should be accomplished through direct taxation and thereafter redistributed through fiscal policy, according to the government's priorities. More recently, however, different commentators have argued for an expanding commitment from the different players involved in the creation of mineral rent in defining its optimal distribution, underlining that a consensual sharing of mineral revenues has the potential to benefit the industry as well as the government (Cawood and Minnitt 2002). This view calls for a more proactive role of the private sector in reaching an agreement. As Cawood and Minnitt put it,

> *"The potential for conflict may be reduced considerably when all legitimate beneficiaries are identified, the hierarchy of claims understood by all and consensus is reached on sharing ratios before mining commences. This implies that the distribution of benefits is no longer the sole responsibility of the host government, with the mineral developer playing a more important role in this regard. It is in the investor's interest that all stakeholders have fair representation during the distribution process as it will considerably reduce political risk."* (2002 p295)

Up to this point, this chapter has introduced a snapshot of the key elements necessary to understand the economic contribution of an industry to the economy, in particular mining. One of the objectives of the present research is to look in detail at each of these elements, making use of some of the mechanisms and techniques available for quantifying the different types of direct and indirect contributions mentioned so far. More specifically, Davis (1990) argued that the focus of regional economic impact analysis should be on the interface between these contributions and the dynamics of host economies. Yet, the characteristics of this interaction in mining have followed notable changing patterns over time, depending on a variety of issues, including the level of technology, the prevalent type of organisation in the global system of production, as well as the social awareness and preferences with respect to business ethics and the role of government and the private sector in economic development. Accordingly, the industry has responded to the new challenges raised by these changes in different ways. All of this is discussed in detail in the next section.

2.3. The role of mining in regional development over time

Three main paradigms for post-industrial mineral development are usually recognised. Radetzki (1982, 1994) identified two of these models and described the differentiated roles played by mining in regional development, and how this changed over time. These are frequently referred to as the Regional and Global models of mineral development. Later, other commentators (Auty 1994; Strongman 1998; Eggert 2001; Humphreys 2000, 2000b, 2002; MMSD 2002, 2003, 2006; Davis and Tilton, undated) have pointed out to the consolidation of a newer paradigm, which has emerged as a reaction to the alleged disappointing industry performances in the field of development. This has since become known as the Sustainable Development (SD) model of mineral development. The models described here are simplifications of reality; a thin line defines the boundaries between each one, and blanket interpretations to describe otherwise complex and region specific developments should be taken with care. For each model, exceptions can be pointed out. Nevertheless, these explanations of the evolution of mining and the way in which it has impacted on the economy over time are helpful to understand the current challenges and opportunities facing local and regional mineral economies.

2.3.1 The Regional model (or the strong local-linkage model)

Until the 1970s, most mineral ventures were relatively small and not too complex, usually aimed at satisfying regional demand[17], and thus concentrated in the industrialised world to a large extent. The machinery and equipment needed for construction and operation were not particularly sophisticated, and thus the capital costs represented a relatively low proportion of total revenues. This, together with a fairly large demand for mineworkers, meant that labour inputs were proportionally much higher than are nowadays. Consequently, most inputs were normally satisfied from within the region. The equipment needed during construction was generally procured locally, either from existing companies or from suppliers set specifically to source the mining industry in the area. The preponderance of local beneficiation from upward linkages was supported by the high cost of transportation, and also by the relative simplicity of the goods and services required (Radetzki 1982, 1994; Eggert 2001, Studwell 2009).

[17] This, for instance, was the typical mine supplying commodities to the European industrial city of the late 19th century.

Downstream beneficiation followed a similar pattern. High transportation costs meant it made more sense to ship high-value semi-finished or finished products than bulky, low-value ore. The ore was then processed near the industrial centres, in some cases also manufactured, and sometimes even sold to consumers nearby. As markets were in close proximity, transportation tended to be minimised. Most processing was done in the region of the mine. Radetzki (1982) suggests that while mineral production was attracted to regions with mineral deposits, the development of mineral deposits was also stimulated by proximity to industrial and urban districts. He argues that exploration activities often focussed on the vicinities of industrial centres precisely because there was a market for the mineral. In other cases, it was the discovery of minerals and metals what favour the emergence and consolidation of urban districts – as an example, consider the importance of the discovery of large deposits of coal and iron in the emergence of the heavy industry area of Pennsylvania, US (Eggert 2001).

In essence, the establishment of a mine was encouraged by the need for minerals locally; then, the mine not only satisfied this demand but also became a pole of regional development through the expansion of the supply chain, on the one hand, and further forward processing, on the other. The mining industry – often encapsulating manufacturing on its way downstream – was predominately regional in scope, rather than global. It is noteworthy that the Regional model had different implications for 'the colonized periphery', or those countries exclusively providing natural resources to the 'core', or rapidly industrialising nations. Here, rather than expanding the local industrial base, mining primarily served the colonial powers that established remote operations to secure the supply of scarce natural resources critical to their own industrial growth (Prebisch 1950, Rostow 1952, Sunkel 1989). However, even in a colonial model that held back local downstream production, economic rationale supported the development of backward linkages. With slow, hazardous, and thus unreliable communications, mining companies would have had to wait for overseas equipment and basic services. Instead, they sought to strengthen local supplies, which in turn led to the development of ancillary industries, particularly for repairs and maintenance (Crowson 2009, 2009b)

2.3.1.1 The industry's response

Regional economic benefits from mining were thus assumed to take place naturally. As with any other economic activity, broader economic opportunities would spill over to the rest of the economy supporting employment and income generation in other industries as well. Most commentators were inclined to think of mineral wealth as a self-evident good, and as a blessing from nature. The industrial revolution was able to take place in Britain partly because of the local availability of the necessary raw materials, and very few have questioned that the mineral wealth of the US played a major part in its growth to world economic power. Consequently, as Humphreys (2000) points out, mining companies did not need to persuade the public about the economic benefits of their activities, since the income they generated, the employment they created, and the taxes they paid were all plainly visible, at least as far as their mines remained in operation.

2.3.2 The Global model (or the weak local-linkage model)

The scientific literature on socio-economic restructuring has emphasised that the shift from a mass production 'Fordist' structure, to a lean and flexible organisation of production in the 'post-Fordist' era, has not only produced substantial changes in the whole organisation of the global economy, but also brought with it new geographical patterns of economic development (for example, Vazquez Barquero 1990, Rodriguez-Pose 1994, Storper 1997). These changes helped transform the old paradigm of mineral production too, and contributed to shaping a new model of mineral development. By 1970, mining was a different industry from the one that helped consolidate the Fordist model of industrialisation in the US and Europe. For the mining industry, Radetzki (1982, 1994) highlights the following key changes:

1. There has been an unprecedented reduction in transport costs[18];
2. The efficient size of mineral ventures has increased considerably;

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[18] According to Radetzki (1982), freight costs per ton of wheat between New York and Liverpool went down from $12.6 in 1990 to $5.5 in1962 (constant 1962 dollars). Freight costs per ton of grain from the US/Canada to the Netherlands went down from $31 in 1955 to $8 in 1979 (constant 1980 dollars).

3. Mining is now a very capital intensive industry, both in absolute and relative terms;
4. Hence, the capital requirements to finance a new mine has increased dramatically;
5. The supply chain has become highly sophisticated and requires scale economies;
6. Due to scale and new technologies, the industry has grown environment-intensive[19];
7. The location of the mines has become more marginal with respect to industrial centres[20];
8. Central governments have appropriated increasing shares of the benefits by the mines.

Transportation costs, especially long-distance sea transport of bulk materials, had fallen significantly by the mid 1960 (Manners 1971, Lundren 1996, Studwell 2009), which allowed for mines to be located far from mineral processing and manufacturing, and these, far from final consumers. The equipment needed to build the mine, as well as the supplies required for its operation, is now sophisticated and specialised. With lower transportation costs, local suppliers, when they exist, cannot compete with global manufacturers for the provision of these products, and so they are imported from outside the region. A similar phenomenon occurs in the downstream processing of minerals and metals. Once basic processing takes place nearby the mine, very little of the output remains in the area, which follows instead the new market logic for the localisation of industrial plants, primarily driven by the pre-existence of manufacturing capacity, low energy costs, skilled labour and, to a lesser extent now, vicinity to markets. At this point, the typical mineral enterprise is a huge, complex and capital-intensive operation, generally located away from urban centres or heavily populated areas, and it supplies the entire world market.

The capital, as well as the managerial and technical skills required to run these enterprises, is rarely found outside large multinational corporations. These enterprises

[19] This is in relation to air and water pollution per unit of mineral output. The trend has reverted after the 70's.
[20] This is because (a) there has been a relative depletion of rich mineral resources located close to major consumption centres; (b) far-away locations have become less disadvantageous due to falling transport costs, and (c) negative environmental impacts have increased the opposition to projects in highly populated areas.

are no longer labour intensive, and although the ever-shrinking requirements for unskilled labour can frequently be supplied locally, in most cases the senior management needs to be brought from abroad due to the specialisation and expertise now required for the job. Also, in times of centralised governance, little of the fiscal revenue from mining goes back to the region, which instead bears most of the environmental consequences of the mineral extraction process. There is little interaction with local communities and the main reference for mining companies is the central government. Regional infrastructure developed by mining companies is exclusively motivated by the needs of the mine and often provides little extra benefit to the broader community (Eggert 2001). These developments recalled the idea of dual economies and unequal trade epitomised in the writing of Prebisch (1950) and the ECLAC[21] (also see Rostow 1952, Palma 1987, Quijano 1989, Sunkel 1989, Cueva 1993). This prompted many commentators to argue that the global model of mineral development could also be referred to as the 'enclave model', as it is in fact a model dominated by mining, which prevents economic diversification due to reduced local upstream and downstream linkages, and leads to dependency on mining activities (e.g. Auty 1993).

The new model is typified by the following characteristics:

1. Negotiations and agreements are held by the central government and the mining companies exclusively;
2. Typically, taxes and royalties are paid to the central administration;
3. Mining companies deal with single persons individually regarding compensations for eventual negative externalities;
4. Training is designed by the mining companies to address their skills requirements exclusively;
5. Infrastructure provision is designed by the mining companies to address their infrastructure requirements exclusively;
6. Supplies are typically sourced from outside the community

[21] Economic Commission for Latin America and the Caribbean.

2.3.2.1 The industry's response - a paternalistic approach

The spontaneous response by the mining industry to these new challenges was to compensate directly for the eventual negative externalities arising as a consequence of mineral production. As a rule of thumb, such compensation first attempted to address concerns of ecological nature, though this rapidly expanded to cover social, and later economic, matters. Once the negative externalities were identified, the companies tended to engage in direct negotiations with those affected most directly and to settle the conditions for the compensation, which often involved direct transfers to the communities in the form of donations. Consequently, this model was characterised by companies adopting a paternalistic approach to local communities.

Mining companies, particularly those operating in remote locations, tended to function as closed systems, largely insulated from the influence of organised public opinion. Harvey and Brereton (2005) argue that their typical attitude is epitomised by the purpose-built mining town, where the corporation was the dominant employer, which owned and provided most of the services (including housing), and managed the town as an essential element of the mine's production system. In this capacity they not only run public utilities – such as water, sewage, power and even housing –, but often also assumed responsibility for the provision of education and health. In some cases, given their size, financial and managerial capacity, companies have performed these public functions formally and have been recognised as acting local government, creating financial and political dependency, which often had alarming consequences the day after closure (Eggert 2001).

Some companies have preferred to decentralise their community investment into *ad hoc* local institutions such as trusts, funds and/or foundations[22]. Companies would normally agree to a pre-established percentage of the companies' revenue as financial contribution, which would often constitute the core of the institutions' income. In some cases, these organisations would also seek external, complementary finance. They would invest in the activities defined in their statute, which would typically include vocational training and further education for the broader community, but could also encompass health, recreation and sports. The scope of these initiatives has

[22] See, for instance, the Rio Tinto's Rössing Foundation in Namibia http://www.rf.org.na/

generally started as local to the mine but, with time, it has often expanded beyond these limits to cover, in some cases, all national territory (Kunanayagam 2003, Yakovleva and Alabaster 2004).

Despite these initiatives, this is the period in which a vast amount of empirical evidence linking mining to poor economic development started to emerge, and commentators began pointing out a negative correlation between mining and economic growth (Auty 1993, Sachs and Warner 1995, Ross 2001, among many others). During the 1990's, a number of notorious industry mismanagements and unsound business operations made their way to the front pages of newspapers around the world and jeopardised the reputation of the industry worldwide. It soon became apparent that the dramatic shift in paradigm discussed above required more than a compensation approach on behalf of the industry. As Radetzki put it:

> *"In the absence of very forceful policy directives, the new mining regions are unlikely to succeed in building up a diversified structure similar to those which exist in many areas of old mineral exploitation"* (1982 p199)

2.3.3 The Sustainable Development model in mining

As the increasing local distress in mining economies was noted by academia, pressure on the industry started to mount. Gradually, the idea that mining had failed to foster sustainable development altogether (and particularly to alleviate poverty in developing regions) spilled over to the rest of the international community. The consolidation of the NGO or 'third' sector, supported by the information revolution of the 1990s, gave these concerns a global dimension. A consolidating view went as far as to recommend that countries avoid mining entirely (Ross 2001; WBEIR 2003, Friends of the Earth, undated). As opposed to the previous models, Eggert (2001) notes that the subsequent changes were chiefly triggered by social pressure to cope with negative externalities, and were thus driven by local demands to a large extent.

Although the SD movement in mining first concentrated on the ecological and social dimensions of these problems, the focus in mining gradually changed towards the economy. It soon became apparent that whereas it is possible to sustain growth while moving fast away from sustainable development, it is impossible to have SD without a feasible economy to underpin it. Sustainable development is referred to as an intra-generational concept and as such it spins round the notion of lasting benefits and opportunities in contrast to a limited-term wealth endowment (WCED 1987). Similarly, novel physics laureate Murray Gell-Mann defined sustainability as living on nature's income, rather than capital (Brigg 2000). Can, then, a feasible and lasting economy that paves the path to SD emerge from mining? Initially, mining would seem to be essentially unsustainable. Individual mines have finite deposits which, once exploited, are depleted forever. Yet, earlier this chapter discussed the industry's proposed approach to sustainability, claiming that even when a mine itself is not unlimited, the economic benefits created by mining can be sustained over time through proper investment, creating wealth long after mining ceases. In other words, proper management should be able to convert a depleting mineral resource into a sustainable source of human well-being (Davis 2000; Humphreys 2000, 2000b).

For Eggert (2001), the fact that mining regions were perceived as (i) bearing a disproportionate share of the costs of minerals development for which they do not seem to be compensated adequately; (ii) receiving an inadequately small share of the benefits, and (iii) not participating appropriately in the decision making that leads to mine construction, has led to a number of efforts aimed at rectifying this situation and enhancing the contributions of mining to local communities and regions, which has became known as the SD model in mining. In this model, negotiations and agreements should include communities and regional authorities; central government shares taxes and royalties with the regional administration; compensations are negotiated with the broader community; training is designed to benefit the community as well as the industry; the infrastructure development aims at addressing both the requirements of the mining industry as well as the broader economy, and supplies are increasingly provided by the local and regional economies. In essence, Stongman (1998) defines the SD model in mineral economies by contrasting it with the previous enclave model. Table 2.1 summarises the key differences.

Table 2.1 – the Global & SD models - features for resource-based economies

Source: Based on Strongman (1998) and Humphreys (2002)

	Global model		SD model
1	Regional policy determined by central government	1	Descentralisation of political power. Devolution
2	Starting to aknowledge environmental imperatives	2	Integrate environmental concerns in decision making
3	Benign neglect regarding social impacts	3	Awakening/learning regarding social impact
4	Communities largely ignored	4	Increasing preasure for consultation
5	Bottom line' dictated by cost competitiveness	5	Pressure to respond to environmental & social issues too
6	Revenue generation	6	Distribution
7	Legalistic	7	Collaborative
8	Competition is the dominant economic model	8	Development of public/private partnerships
9	Project-based development	9	Integrated regional development
10	Special skills dominated by engineers and geologists	10	Multidisciplinary approach

As opposed to the previous model, companies need to operate increasingly as open systems. There are several reasons for this change in focus, including higher community expectations, the dramatic increase in global scrutiny and the seemingly demise of the traditional mining town. Harvey and Brereton (2005) argue that under a SD model, communities have become active participants in the governance process, which is now referred to as the 'triple bottom line' (i.e. governments, companies and communities). In this emerging tri-polar governance landscape, communities frequently represent themselves when dealing with businesses, whether through public forums, delegate bodies or the agency of NGOs. In turn, corporate entities are now obliged to develop direct relationships with local communities and governments. Thus, the notion of SD suggested a shift in power and responsibility to the sub-national level. Humphreys (2002) argues that the old enclave model gave primacy to national economic objectives. In essence, it emphasised mining's contribution to national income, export earnings, employment and other aggregate economic variables. Consistent with the notion of mineral deposits as the embodiment of patrimonial wealth, the economic surplus from mining was essentially for central government to dispose of in what it deemed to be the collective national interest. The focus of the SD model, by contrast, is on optimising the regional impacts of mining and on ensuring that a significant part of the economic benefits from the industry is retained in the region in which the rent is generated.

2.3.3.1 The industry's response – Corporate Social Responsibility

The industry has increasingly come to believe that the consolidation of this new paradigm is not a matter that can be left to national authorities alone. Even at the risk of being seen as impinging on government sovereignty, many companies have determined that they need to take an active part in ensuring that the regions in which they are operating receive a reasonable share of the economic benefits from mining, and to lay down the basis for sustainable economic activity after they have gone. Humphreys (2000) argues that this is not entirely altruistic behaviour. He claims that it is rooted in the industry's late understanding that communities which are convinced of the economic value of mining to them are more likely to be publicly supportive of mining and to be advocates of mining in national capitals.

For Harvey and Brereton (2005), the primary business drivers for this enhanced involvement are the desire to better manage social risks and to achieve competitive advantage through self-regulation, community and employee endorsement, and reduced financial volatility. Companies increasingly strive for competitive advantage in the community arena as well, with the aim of becoming the 'developer of choice' for communities and governments, improving the corporate risk profile and securing access to capital on more favourable terms. Moreover, in order to manage the risk of losing access to land for exploration and developing mines, companies need to take some decisions about expenditure beyond the technical scope of projects. While in the past this was restricted to well-defined taxation and royalty payments to governments, the SD approach may involve negotiated contracts with other stakeholders to gain endorsement.

More broadly, this resurgent preoccupation with business ethics and the social dimension of business activity consolidated under the concept of Corporate Social

Responsibility (CSR) back in the early 1990s (Henderson 2000, The Economist 2005). While these concerns have been around for a long time, Fabig and Boele (1999) argue that this debate is now conducted at the intersection of development, environment and human rights, and are more global in outlook than ever before. The development in global corporate communication that has enabled corporations to control production activities on a global scale has also facilitated the international transmission of information about conditions in overseas operations, contributing to increased public awareness and facilitating campaigning activities (Jenkins 2004)

Meanwhile, the main multilateral agencies (MLAs) saw in the CSR agenda an opportunity to rely on large firms to promote development in accordance with their mandates. The UN leaped on to the CSR movement with the creation of the Global Compact in 2000 (Global Compact website 2005). In 2001, the European Commission (EC) defined CSR as 'a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis' (EC 2001 p8). The World Bank, too, actively promotes CSR through its CSR Practice and its training arm, the WB Institute (WB website 2005). The DFID (website 2005) argues that the growth generated by the private sector has the potential to be more inclusive, equitable and poverty reducing when companies adhere to the CSR framework.

In the beginning, CSR had not explicitly dealt with the economic implications of business activities and their impacts on poverty. This omission led some commentators to call for a shift to a more development-oriented approach, integrating economic concerns to the pre-existing social and environmental spheres (Fox 2002), which, in the mining industry, lead to the embracing of the SD agenda (ICMM 2002, 2003, 2006). A large number of cooperative industry initiatives and bodies have been established in recent years with the objective of consolidating this new approach at the industry level; the most influential of them being the Global Mining Initiative (GMI); the Mining, Minerals and Sustainable Development Project (MMSD); the International Council for Metals and Minerals (ICMM); the Extractive Industries Transparency Initiative (EITI), and the Global Reporting Initiative (GRI).

The GMI brought together many of the world's largest mining companies to ensure that the sector as a whole was being responsive to these global needs and challenges. This initiative had three main components: (i) an independent analysis of the key issues facing these industries; (ii) the creation of an industry association that could focus on sustainable development in the mining, metals and minerals industry; and (iii) a global conference on mining, metals and sustainable development, held in May 2002[23]. The objective of all three components was to reach a clearer understanding of the role the industry can play in making the transition to sustainable patterns of economic development. In May 2002, following the publication of the final report of the MMSD project, the establishment of the ICMM, and the close of the global conference, the GMI ceased to exist as a separate entity (ICMM website 2005)

The MMSD was an independent two-year process of consultation and research with the objective of understanding how to maximise the contribution of the sector to SD at the global, national, regional and local levels. The Project began in April 2000 and was designed to contribute a consistent body of research (final report published in 2002) and to establish a dialogue process to be carried forward into the future. The MMSD proposed an agenda for global change in the minerals sector based on participatory analysis including governments, communities and the industry (MMSD 2002). The following were the key general objectives of MMSD[24]:

- First, to assess global mining contribution to economic prosperity, human well-being and ecosystem health, as well as the track record of past practice;
- Second, to identify how the services provided by the minerals system can be delivered in accordance with the SD model in the future;
- Third, to propose key elements of an action plan for improving the minerals system;
- Fourth, to build platforms of analysis and engagement for ongoing cooperation and networking among all stakeholders.

[23] The conference itself contributed to the World Summit on Sustainable Development in Johannesburg in the fall of 2002, which marked the 10th anniversary of the Rio Earth Summit.
[24] As defined in the MMSD Scoping Report produced by the International Institute for Environment and Development (IIED), which was commissioned by the World Business Council for Sustainable Development (WBCSD) in 1999

The ICMM is an industry association whose main purpose is to focus on sustainable development in the mining, metals and minerals industry. In essence, the ICMM provides a common platform for the industry to share challenges and responsibilities and to engage with key constituencies on issues of common concern at the international level. The council's chief objective is to achieve continuous improvements in sustainable development performance in the industry. More specifically, the ICMM aims to (directly from ICMM website):

- Offer strategic leadership to achieve improved sustainable development performance in the mining, minerals and metals industry;
- Represent the views and interests of its members and serve as a principal point of engagement with the industry's key constituencies in the international arena;
- Promote science-based regulations and material-choice decisions that encourage market access and the safe production, use, reuse, and recycling of metals and minerals;
- Identify and advocate the use of good practices to address sustainable development issues within the industry.

The EITI is a coalition of governments, civil society groups, companies, investors and international organisations with a common purpose to improve governance in resource-rich countries. It aims at improving transparency and accountability in the extractive sector by verifying and publicizing company payments and government revenues from oil, gas and mining. The ultimate purpose of this initiative is to increase the likelihood that the revenues generated by natural resources in developing countries will be used in an efficient and equitable manner, while significantly reducing the risk of misappropriation of these funds. The EITI is a voluntary initiative and countries need to endorse the EITI criteria[25] to become eligible members. There

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[25] The EITI Criteria (EITI website, visited November 2005):

a) Regular publication of all material oil, gas and mining payments by companies to governments ('payments') and all material revenues received by governments from oil, gas and mining companies ('revenues') to a wide audience in a publicly accessible, comprehensive and comprehensible manner;
b) Where such audits do not already exist, payments and revenues are the subject of a credible, independent audit, applying international auditing standards;
c) Payments and revenues are reconciled by a credible, independent administrator, applying international auditing standards and with publication of the administrator's opinion regarding that reconciliation including discrepancies, should any be identified;

is a close link between this initiative and the World Bank Group. In addition to administering a multi-donor EITI trust fund, the Bank is committed to pushing the EITI agenda in member countries and to supporting governments with its implementation. By 2006, over thirty countries had either endorsed or were actively implementing EITI across the world (EITI website, 2006).

Finally, the GRI is a multi-stakeholder process and independent institution with a mission to develop and to disseminate Sustainability Reporting Guidelines around the world. These are non-compulsory guidelines for voluntary use by organisations for reporting on the economic, environmental, and social dimensions of their activities, products, and services. The GRI incorporates representatives and feedback from business, accountancy, investment, environmental and human rights researchers and labour organisations globally. It was set up in 1997, and it has since continued as an official collaborating centre of the United Nations Environment Programme (UNEP). In 2005, GRI and the ICMM released the pilot version of the Mining and Metals Sector Supplement, which provides specific guidance on reporting against the GRI guidelines for companies in the mining industry specifically. The supplement provides detailed direction to mining firms as to produce meaningful and comparable reports (GRI website).

At the firm level, most large firms in the mining industry today claim to have embraced the principles of SD and to have spent fairly significant sums to identify and mitigate the social and environmental costs from their activities at the local and regional level. More particularly, they have frequently assisted host communities to take advantage of the opportunities for economic development that these enterprises claim to create where they operate, including, for instance, the local sourcing of labour, or the demand for local goods and services. Several compilations and reviews of these initiatives in these and other areas have been typically produced and published by either mining companies or industry bodies (Prescott 2009). In terms of

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d) This approach is extended to all companies including state-owned enterprises;
e) Civil society is actively engaged as a participant in the design, monitoring and evaluation of this process and contributes towards public debate;
f) A public, financially sustainable work plan for all the above is developed by the host government, with assistance from the international financial institutions where required, including measurable targets, a timetable for implementation, and an assessment of potential capacity constraints.

corporate governance, the overarching commitment to these principles is generally articulated in publicly available documents stating the organisations' strategy with regards to SD, and often too, their key targets and performance indicators (for instance, Anglo American website, BHP Billiton website, Placer Dome website, Rio Tinto 2005). Notwithstanding these global frameworks, sustainable development initiatives are essentially region specific and thus the industry has often asserted that their design as well as justification would necessarily respond to local and regional drivers, which will in turn reflect different corporate cultures.

Consider the following example: ways of supporting the development of local suppliers has been a typical SD focus area, where different companies have adopted different strategies. Responses to the Black Economic Empowerment (BEE) schemes in South Africa serve as illustration. BHP Billiton tackled this challenge directly by implementing a new company procurement policy, and by establishing a central BEE supply unit within the firm. Developmental assistance encompasses the provision of training in tendering processes; help with negotiating financing arrangements with banks; splitting contracts into smaller components to provide more opportunities for Black suppliers; and support in acquiring materials or facilitating working capital in the form of soft loans (BHP Billiton website). Similarly, Richards Bay Minerals, a Rio Tinto managed business in South Africa, has also followed a centralised approach, though it claims to go as far as to identify promising small businesses directly, to which they would provide proactive mentoring (Rio Tinto 2005). Zimele, instead, is the decentralised enterprise development unit of Anglo American, which targets all company operations in South Africa. Its assistance takes the form of equity and loans. Business development officers help putting business plans forward for approval. If the venture is viable, the organisation takes a minority equity stake and provides finance (Anglo American website).

Guided by these principles, mining firms have also continued to promote development initiatives largely disconnected from their systems of production. For instance, supporting the development of small enterprises outside the industry's supply chain would not necessarily improve the operability of these companies, and thus it has been in the past more frequently associated with development agencies than with corporations. Mining houses have often preferred to address these challenges through multi stakeholder partnerships including NGOs, development institutions, academia, government, and civil society groups. In the socioeconomic arena, these associations have frequently focussed their work on business development, poverty alleviation, and social investments in education and health (Prescott 2009). A key question remains: to which extent can these mining-sponsored associations ensure the durability and further applicability of development initiatives that are not, in a pure sense, mining-related?

2.3.3.2 Did it work?

This chapter explained why mineral-based economies face quite distinct challenges. It also noted that these challenges are today fundamentally different from those in the past (Davis 1990). Incarnating the industry's interpretation of the SD movement, CSR consolidated in mining as an attempt to respond to these challenges on a voluntary basis. Companies came to believe that they now needed to play a more proactive role in regional economic development if they wanted to maintain their 'social licence to operate', and even perhaps reposition themselves as leaders in a new area seen as possible source of competitive advantage. While elsewhere the notion of SD had been around for years, it only gained momentum in mining towards the end of the millennium. It is currently difficult to find a mining corporation that does not claim to embrace SD as part of the way they operate.

Many in the industry have claimed that SD should be seen as a new way of operating mines, so that economic, social and environmental principles integrate into business management (Clifford 2005). Essentially, companies have argued that this new framework can align business needs with those now articulated by the broader community, and that it proposes a change in the way managers approach business altogether – particularly their relationship with local and regional stakeholders. Moreover, some policy makers have identified these voluntary approaches as a stepping-stone towards legal codification (for instance, the World Bank website). Where there is a strong system of governance, they might be a way of extending company accountability without the need for a new legislation; a complementary approach encouraging businesses to act responsibly but not an alternative to the rule of law. Where the rule of law is weak, voluntary approaches can encourage multinational companies to introduce higher levels of performance than those required for local legal compliance.

This new approach did not come without dissent. Most criticism to the new agenda falls into two groups. The first, which could be characterised as the 'CSR is bad for capitalism' school, echoes Friedman's famous claim that a company's overriding social obligation lies in creating wealth for the society by operating profitable businesses and thus creating employment opportunities; moreover, that the whole issue of SD is a distraction from its core function. According to this view, CSR is inherently misguided in principle. By pursuing social and environmental objectives, firms may ultimately hurt shareholders by generating lower profits than otherwise possible (Friedman 1962; Henderson 2002). Some commentators have recently argued, nonetheless, that this argument applies best where mining companies are operating in mature, developed economies; where markets work well; where governments are responsive and effective, and where, as a result of all these things, the environmental and social externalities of mining are largely reflected in a company's costs through existing regulation and taxation. Within the current pattern of mineral production, these conditions rarely apply in developed countries – and effectively never in developing countries (Humphreys 2002)

The second branch of criticism argues that companies should assume full responsibility for the broader impact of their business activity, far beyond current CSR or SD practices. According to this view, planning and implementation of social programs by firms is simply inadequate and insufficient. Many of these critics consider that the delivery of economic development programmes should be the domain of the state regulators or argue that, at a minimum, the state has an obligation to monitor corporate social programs. In the absence of state involvement, SD initiatives such as corporate codes of conduct or ad hoc community investment initiatives tend to lack efficiency as well as coordination across firms and industries, and that there are few, if any, sanctions for non-compliance (Waddell 2000). Further, Margolis and Walsh (2003) illustrate this misalignment by pointing out that much of the research on CSR these days focuses on its potential contributions to companies' profitability, rather than on its impact on development[26].

Have the industry's interpretation of the SD model promoted a new type of interface between mining enterprises and the local and regional economies where they take place? If so, has this new type of interaction phased out the disadvantages allegedly suffered by mineral economies in the past, or, to put it differently, has mining under these principles contributed positively toward regional economic development? As this voluntary approach claims to respond to criticism largely leveraged at sub-national levels, the answers to these questions need to be found at the local and regional levels principally. As these concerns are essentially specific to each location, a range of different situations need to be considered for conclusions to remain widely relevant. Consequently, this research took a deep insight into three different cases; three large mining operations majority-owned and managed by Rio Tinto, one of the largest mining corporations in the world. A first description of these cases, as well as the rationale for this selection, is introduced in the next chapter.

[26] Two other, more radical critical schools should be acknowledged: one that disputes that capitalism can make any contribution to the social or environmental cause at all (Kelly 2001), and another that views CSR as nothing more than good capitalism and therefore not worth thinking about in its own right (Sorell and Hendry 1994, Freeman 2004)

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Chapter 3

Defining the study object: Rio Tinto and its three subsidiaries

3.1. Rio Tinto and the industry structure

The end of the last millennium has seen an acceleration in the consolidation of the mining sector following a series of corporate events that have helped reshape the industry, such as a number of significant mergers and acquisitions. The net result has been a dramatic increase in the proportion of industry value represented by the largest companies: in 2004 the top five corporations represented 59% of the MSCI Global Mining Index[27], up from 33% in 1995 (Thomson Financial DataStream, 2005). Significant M&A activity has, in fact, continued throughout the commodity boom. A second notable feature of the industry's evolution in the last decade has been the continued emergence of a tier of new players, primarily composed of former state-owned companies and commercially-oriented state-owned enterprises, like the Chilean Codelco, the Brazilian CVRD, the Russian Norilsk and Rusal, and a number of Chinese firms including Shenhua and Chalco. Freed from many of the traditional restrictions of national ownership, these firms have been improving the efficiency of their operations, consolidating the industry in their home countries, and many of them have started a process of international expansion (Humphreys 2003).

In addition, the effect of the impressive growth of the Chinese economy on the worldwide demand of minerals and metals has continued to consolidate. It is now also widely accepted that this effect will continue to shape the industry in the short- and mid-term, and that the Chinese import-and-export profile of minerals and metals is set to have a permanent effect on the economics and attractiveness of the different commodities for mining corporations. Similar effects are coming evident from other developing nations, particularly in India, Brazil and some other countries of the former Soviet Union, where the need for modern infrastructure is accentuating the demand for basic materials. Many of these countries are going through a phase of growth which is particularly materials intensive. Across developing countries as a whole, a percentage growth in GDP is typically twice as mineral intensive as a percentage growth in GDP in developed countries (The Mining Journal 2004, 2005). As part of the transition undergone by the world's most developed nations towards the services sector and away from basic industry, during the 1990s, mining companies

[27] Morgan Stanley Capital International

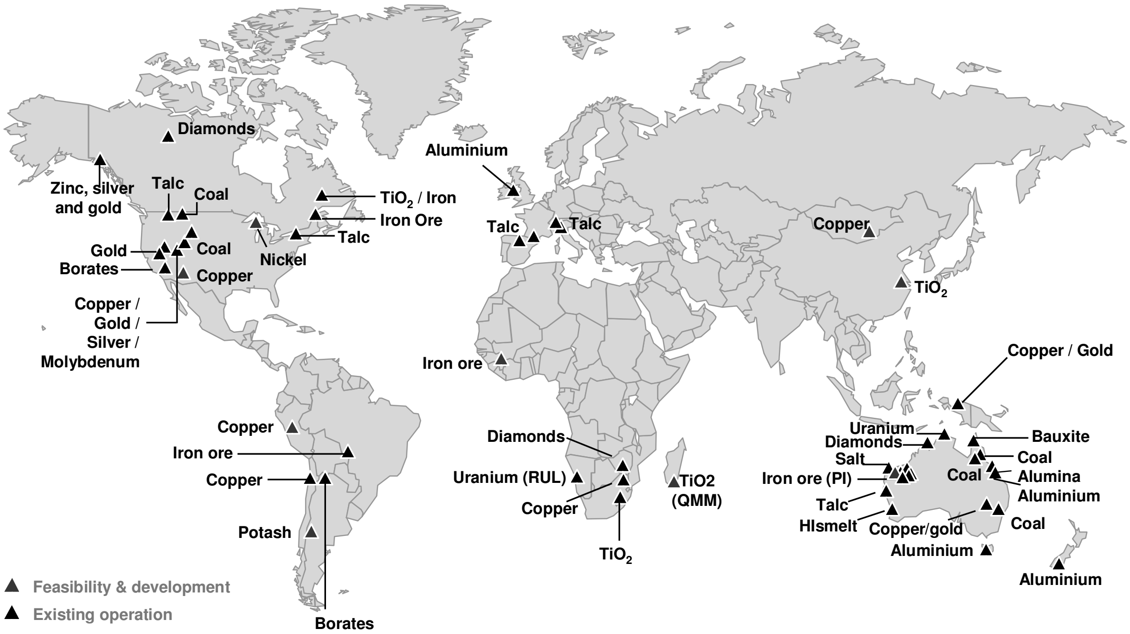
became less attractive to investors in overall terms. The commodity boom of the 2000s brought with it a reversal of that trend. Some analysts have argue that this, together with the increase consolidation evident in industry, means that company size will become more important to some investors; that large institutional investors may limit the number of mining companies they follow; and that this will also increase shareholder expectations for growth (Crowson 2004). As the global mining sector combined into fewer, larger companies, there has been an increasing realisation that these larger companies were also those setting the industry's benchmarks for the mining and sustainable development (SD) agenda too (ICMM 2003).

Within this context, Rio Tinto is one of the largest mining corporations in the world; in fact, in 2004 it was the largest pure-mining company measured in terms of total market capitalisation[28]. With headquarters in the UK, Rio Tinto is a dual listed corporation combining Rio Tinto plc, a London listed public company, and Rio Tinto Limited, which is listed on the Australian Securities Exchange (Rio Tinto 2006b). Functionally, however, it operates as a single entity structured in five product groups – Iron Ore; Energy; Aluminium; Copper & Gold; and Diamonds & Industrial Minerals –, investing in mining businesses and operating subsidiaries in more than 20 countries[29, 30] (Figure 3.1). Although Rio Tinto has long been active in the developing world, its operations are heavily oriented to Australia and North America, which contributed around 85% of total revenue in 2004 (Rio Tinto 2005b). This brought with it obvious benefits to the corporation in the form of a lower risk premium during the commercial evaluation of investments. However, as the remaining unexploited high-quality ore bodies is frequently assumed to be in less accessible and thus less explored regions, all too often within underdeveloped economies (The Mining Journal, various issues 2004), some analysts have identified Rio Tinto's geographical bias as a potential weakness looking into the future (Citigroup 2006)

[28] The market capitalisation of BHPB continued to be larger than Rio Tinto's (US$100 billion and US$79 Billion in 2005, respectively), although BHPB derived large part of its value from its oil and gas division. The value of Rio Tinto and its competitors fluctuated significantly following the Global economic swings of the late 2000s.
[29] The Rio Tinto Board reshuffled the company structure in 2009, reflecting a new balance and relative importance of the different commodities produced. This move followed the acquisition of Alcan (bauxite, alumina and aluminium) and the surge in iron ore production, among other reasons.
[30] These increased dramatically with Rio Tinto's acquisition of Alcan. By 2009, the Group had business interests in more than 50 countries.

Figure 3.1 – Rio Tinto investments worldwide, by commodity, 2007

Source: Rio Tinto



Rio Tinto has started to expand the range of investment locations that it considers for value potential. Good examples of this are the assessment of deposits in non-traditional prospective areas such as Guinea, Iran, India, Madagascar, Mongolia and Russia, among others (Rio Tinto 2006). Increased flexibility in Rio Tinto's approach to the location of its assets will provide a greater range of development opportunities for the company, but will also bring with it an increasing need to understand and manage the more complex risks involved in these environments (Citigroup 2006). Access to these resources, as well as keeping a 'social license to operate' them, shall require constantly reviewing the business approach to issues of sustainable development in general – and regional economic development in particular. The next section discusses the economic significance of Rio Tinto and the company's role in leading the transition from the Global Model of development to the SD movement. Section three explains the methodology for this research and introduces the three Rio Tinto subsidiaries that constitute the study subjects of this investigation. Final remarks and conclusions take place in section four.

3.2. Rio Tinto's quest for regional economic sustainability

3.2.1 The economic contribution of Rio Tinto

How big is the aggregate economic activity of Rio Tinto? Chapter 2 discussed that one way of understanding the size of a company's economic activities is to look at its gross turnover. In 2004 Rio Tinto's gross turnover was US$14 billion. However, while this interpretation is appropriate at a company level, when the focus is on the broader economy, we saw that it is more accurate to measure economic contributions in terms of companies' value added. Value added is calculated as the difference between a firm's gross turnover and its payments to suppliers. Summing up value added across all enterprises in a country should equal GDP/GNP[31] (for instance, Begg et al 2000, De Grauwe and Camerman 2002). Total value added by Rio Tinto was US$7.5 billion in 2004, which represented 54 % of the Group's gross turnover (Rio Tinto 2005b). For consistency with the rest of this research, this analysis is based on 2004. It is worth noting, however, that value added by Rio Tinto worldwide continued going up steadily, reaching $28.5 billion in 2008.

In a very profitable year for the mining industry[32], money retained within Rio Tinto accounted for US$2.7 billion in 2004. In the same year, Rio Tinto's payments to the providers of capital were US$1.3 billion; 90% in dividends[33, 34] and the balance in interest payments and other financial items (Rio Tinto 2005b). However, because the conditions for thriving capital markets do not usually coincide with the remote and isolated places where mining typically operates, these components of value added often have a negligible effect at the local and regional level. As a general rule in mining, economic benefits from these financial obligations are more likely to be felt in large urban districts than in the remote environments most familiar to mining (Di Boscio 2004).

[31] For more on this see Chapter 2, section 2.
[32] Prices for most mineral commodities reached unprecedented highs in 2004, although most continued rising until 2008
[33] Mostly to institutional shareholders concentrated in the UK, North America and Australia
[34] In 2005 Rio Tinto declared record profits. In addition to the above mentioned dividends, the company declared a further ordinary dividend and special dividend payment in respect of 2005, of US$0.5 and US$1.5 billion respectively. On top of these, Rio Tinto announced a share buyback of US$877 million in 2005.

In contrast, Rio Tinto reports that the net effect of labour payments is largest nearby the operations. According to the company (Rio Tinto 2005c), Rio Tinto paid US$2.1 billion in wages and salaries in 2004. 76% of these payments took place at the local level of the operations, 13% at the State or regional level, a further 10% somewhere else in the country – and just 1% was paid abroad. With regards to taxes, the company's tax and royalty charge was US$1.5 billion in 2004. Although federal governments collect most of the taxes and royalty payments, Rio Tinto claims that local and regional governments receive approximately one third of the total take. It is to be noted that this breakdown only captures where tax payments are made and not the internal redistribution of revenues that takes place within governments (Rio Tinto 2005c), which will probably understate the ultimate effect of these payments locally. Additionally, a company such as Rio Tinto generates a significant income stream to governments through indirect and other taxes such as employee taxes, social security contributions or custom duties.

Further to the calculation of value added, Rio Tinto's demand for materials, facilities and services from other sectors of the economy was US$6.5 billion in 2004, which represented 46% of the Group's total turnover. Chapter 2 explored the challenges and opportunities that the literature has attributed to this type of expenditure. Yet, assessing the geographical footprint of a company's supply chain can be complicated. To begin with, tracking down records of every purchase by the industry, out of millions in a year, is virtually impossible. Also, many suppliers are themselves purchasers of materials and goods from elsewhere. The analysis by Rio Tinto uses the mailbox addresses on the vendor's invoices as proxy for this. Overall, 31% of Rio Tinto purchases were supplied at the local and regional level, and as much as 80% within the country of operation. Looking further, however, there appear to be large disparities among Rio Tinto businesses – e.g. imports by Australian operations will tend to be smaller than those by African companies (Rio Tinto 2006b). This study is posed to explore the nature and consequences of these differences in detail.

Rio Tinto also claims it supports circa 2,000 socio economic programmes every year, covering a range of activities including health, education, business development, housing, environment protection and agriculture. In 2004, the company invested an estimated US$70.5 million in these initiatives, including commercial and business development, charitable gifts, management costs and other legally binding agreements for payments to trusts, funds and foundations. In addition, there is also the economic stimulus from the capital invested by Rio Tinto in developing or expanding projects, including infrastructure that, in some cases, can be used by local communities and other parties.

While all these calculations provide an idea of the magnitude of the company's economic activities, they say little about Rio Tinto's manoeuvring capacity over these contributions or, for instance, its ability to substitute imports with local firms; employ locally; or influence the level of public expenditure invested back in mining regions. Moreover, focussing too much on these capital flows from the company risks overlooking how the regional economies affected have coped with these stimuli. It should also be established whether these characteristics are intrinsic to modern mining, and whether efforts by the industry can significantly affect the geographic patterns of these payments – or if they instead remain at the margins. These questions too are the subject of this investigation. Before starting to address them, however, the remainder of this section explores Rio Tinto's drivers for embracing, (and its role in shaping), the SD agenda in mining.

3.2.2 Rio Tinto and the embracing of sustainable development

Despite the relatively large figures introduced above, the 1980s saw Rio Tinto's reputation deteriorating rapidly across the world, parallel to that of the industry as a whole. As previously discussed, mining companies have throughout history followed different stereotypical patterns of interaction with their host economies, which have been largely shaped by variables including the prevailing structure of industrial production and level of technological progress at the time (see chapter 2, section 3 for details). For simplicity, these types of interaction have been typically encapsulated under either the Regional Model, first; the Global Model, second; and the Sustainable Development Model of mineral production, more recently. Beyond these generalisations, however, single corporations have been impacted by specific circumstances, events and individuals that have enabled (or hindered) the transition from one model into another. This section explores, in particular, Rio Tinto's path through this process.

3.2.2.1 The Regional model

During most of the history of mining, the economic benefits from the sector were assumed to take place naturally, and therefore mining companies did not need to persuade the public about the social merits of their activities (Humphreys 2000). Some localised negative environmental and social externalities were broadly taken as a small price to pay for an industry that constituted the pillar of nearly all industrialised regional economies. This period has been referred to as the Regional Model of mineral development. In the second half of last century, nevertheless, deep changes in technology and the broader structure of production worldwide put this old model in crisis, an increasing part of the international community on the alert – and the mining industry on the defensive. While scholars of the dual economy and unequal trade (Prebich 1950, among many others) had been making the general case for national economies to avoid specialising in natural resources, the largest mining houses, with Rio Tinto among them, suddenly became the focus of heavy scrutiny and criticism by the consolidating NGO movement and a large section of academia (e.g. Tanzer 1984)

More broadly, this is when the notion of 'ethical investment' started to gain momentum within investment portfolios, as some investors began to ponder ethical considerations at the time of buying companies' shares. In separating the good from the bad, more often than not mining ended up together with weapons, tobacco or oil & gas. As the wave of indignation against these sectors gathered force, there were notable instances of disinvestment. Suddenly, the environmental, social and economic consequences of a company's activities started to threaten its own financial sustainability (Allsop 1995). While this distinction was generally made on a sectoral basis, different companies suffered the stigma of being a bad neighbour more than others, and Rio Tinto often fell into that category. As an illustration, one of the most conspicuous cases of disinvestment during that time took place in 1972, when the Church Commissioners of England withdrew what had been until then a long term and fructiferous investment in Rio Tinto because it now considered that some of the company's practices were unethical (Allsop 1995). Beyond the symbolic importance of losing this investor, the external pressure on the company kept on mounting.

3.2.2.2 The Global model

Consistent with the broader approach by the mining industry more generally, Rio Tinto's response to the international community during this period was largely based on the principles of patronage and philanthropy (Kunanayagam 2003). Writing about Rio Tinto, nevertheless, Pettifer (1998) argued that, as opposed to the previous model, the so-called 'age of paternalism' should not be misread as the industry's disregard for the social, economic and environmental impact of mining activities. Instead, this is a time in which large companies evidenced a genuine concern for their communities – but treated them with lofty superiority. As an example, Rio Tinto's preferred model for housing employees at the time was that of company towns, where the firm kept full control of the towns' amenities and infrastructure, while taking responsibility for safety and policing inside its borders (Harvey and Bereton 2005). Within the company stores, hospitals and schools '[…] there was no place for a free spirit who might question company wisdom' (Pettifer 1998, p4).

At the corporate level, this approach was characterised by a focus on direct transfers to the communities hosting Rio Tinto businesses. By large, these initiatives consisted of donations for addressing community concerns. While they followed different local agendas, they were typically disconnected from the industrial process of mineral production or any other mainstream company activity. As an illustration, every issue of the Rio Tinto's quarterly publication 'Review' devoted a section of the magazine to the latest community programs. These spanned from promoting asparagus plantations in Namibia or combating tuberculosis in Indonesia, to supporting medical research in Australia or committing corporate donations to the Natural History Museum in London (Review 1997, various issues). Another key feature of this period was the company's preference for outsourcing issues of community management into independent organisations, such as foundations. In Rio Tinto, the early foundations were initially set up in Namibia and Papua New Guinea, during the 1970s. The considerable success of these initiatives heralded them as flagship instruments and led to the concept being exported elsewhere. Nonetheless, efforts were largely concentrated at the national level and aimed at helping improve the company's image as a wider contributor to society. In the beginning, these institutions would rely financially on Rio Tinto, although later their independent status enabled them to attract funding from outside donors (Kunanayagam 2003).

All these company responses were at first greeted positively – for instance, the Church Commissioners for England resumed their commercial relationship with Rio Tinto in the early 1990s (Allsop 1995). Towards the end of the 1980s, however, the Global model of mining development had started to crumble, due mainly to a number of strident industry failures in coping with the environmental and social implications of mining, primarily in developing countries, but also because of the escalating scrutiny by the international community, which started to perceive company initiatives as merely public relations strategies, hollow of content. For Rio Tinto in particular, however, one key incident sullied the company's name, and impacted the public perception of Rio Tinto more than any other. This incident took place at the Rio Tinto's majority owned operation in Panguna, in the island of Bougainville (PNG), one of the world's largest gold and copper open-pit mines in the world at the time.

In Bougainville, Rio Tinto needed to dismantle rain forests to access the mineral deposit and to relocate villagers to make way for the mine. On this island, community beliefs and behaviours are rooted on a strong relationship with nature; regardless of the operating and environmental permits in place, the activities by the company eroded the local culture and contributed to dismantling the subsistence economy. Later on, claims emerged that mine waste had filtered into rivers and the ocean, affecting the fish that locals depended upon. Tensions over environmental problems and the distribution of the mine's revenues grew. Angry landowners, who morphed into a revolutionary movement seeking independence for Bougainville, blew up power sources to the mine in 1988 (The Guardian 2001). In response to the revolutionary movement, the PNG government established a military blockade that, according to the Guardian (2002), prevented essential supplies like food and medicine from reaching the island – the PNG government owned a 19% share of the operation.

Rebels slipped into the rain forest, and instigated an eight-year civil confrontation that cost the lives of about 15,000 civilians. During this period, the company was accused of transporting soldiers and of pressuring the government to do anything necessary to reopen the mine. Rio Tinto's position has always been that the company played no part in the civil strife, and that neither the firm nor its employees conspired to commit any acts of violence. An independent study conducted for the PNG government in the late 1980's found, however, evidence of environmental damage from the mine (The Guardian 2002).

The way in which the episode was managed by the company exposed the costly consequences of a number of emblematic management procedures back then – particularly the company's disregard for the local population and its preference for dealing with the central administration – as well as the short-sightedness of the prevailing community development strategies. Gradually, the company started to question the whole approach to community development more broadly. At that time, for instance, the Rössing Foundation[35] asked to stop the aid wagon going to Rio Tinto's communities in Africa and to rethink the whole strategy to economic development, as evidence was showing these contributions were largely ineffective (Godfrey 1995). The idea began to consolidate within the company that the real problem in these communities was not necessarily shortages of money, but rather that the available resources were not used properly. In the 1990s, Rio Tinto realised that changing the company's reputation was now a business imperative, as well as moral cause. By then, however, public perception of the extractive industry performance was based on increasingly damaging popular judgment. Rather than attempting to change perceptions, Burke (1998) claimed that there was a real need for changing performances:

> *'In the developing world […], few industries offer poorer countries as good an opportunity as mining for increasing incomes rapidly, and also transferring skills and technology. […] But for that case to be believed in the court of public opinion mining must rid itself of its outmoded image. […] Performance*

[35] The Rössing Foundation is a decentralised organisation created by Rössing Uranium Limited, a Rio Tinto subsidiary, with the aim of promoting community activities such as education and training in Namibia.

> *improvements on their own will not change perceptions. Efforts to change perceptions that are not based on real and continuous performance improvements will soon be seen through'* (Environmental Policy Advisor to Rio Tinto, Tom Burke, 1998 p5)

Later on, Rio Tinto Chairman Robert Wilson would emphasise that:

> *'Crucial to the changing of the industry reputation […] is the willingness by company leaders concerned to acknowledge that the industry has a case to answer in terms of both social and environmental performances. The way forward should not be by hopeless efforts to sway public opinion but rather to accept that we have made mistakes and to actively engage with and listen to our critics'* (Wilson 2001, p2)

Overall, these realisations prompted a dramatic change in corporate culture. It was at this time that Rio Tinto declared the beginning of the age of 'post-paternalism' (Pettifer 1998).

3.2.2.3 Rio Tinto and the age of post-paternalism – or the SD model

Richard Holme, former Rio Tinto director responsible for external affairs and human resources, described 'the age of post-paternalism' as the redefinition of 'community' (Pettifer 1998). In the past, a mining community encompassed the workforce and their immediate dependants, while nowadays '[…] the list includes anyone impacted in any way, economically, socially and environmentally by the operations of the mine. We must also include the representatives of national and local governments and NGOs. In the age of post-paternalism, all the individuals and groups must be considered and consulted by Rio Tinto' (Pettifer 1998 p.4). This broader understanding of communities came together with an internal review of the industry's priorities in this area. Major scientific advances in the management of physical and chemical impacts had started to shift the focus from the environmental to the socio economic implications of mining by the mid 1990s:

> *'The bigger challenge now is not a technical one. Rather it lies in the development of interactive and lasting relationships with the communities and regions in which the industry operates. Within this context, the industry's treatment of the physical environment is but one factor'* (Chief Economist Rio Tinto, David Humphreys, 1996 p23)

Accordingly, Kunanayagam argues that community efforts by Rio Tinto evolved from one of patronage to that of sustainability, and community relations is now seen as a core business activity and critical to successful risk management. For instance, in reviewing the role of the old foundations, she declares that these institutions can no longer be seen as a substitute for the company's community relations responsibilities (Kunanayagam 2003). This expanded notion of communities also benefited from the increasingly popular concept of SD in mining. Humphreys (1996) claims that, in an economic sense, this debate re-establishes as the basic conditions of sustainability the principle that the depreciation of one capital asset needs to be compensated by the creation of other capital assets with at least the same earning power. These other assets may take the form of new mines, but they may equally be in the form of manufacturing businesses, farms or service sector activities such as schools and tourist facilities.

For Rio Tinto, a further challenge was that a firm may not be able to earn a good name if the industry had such a collective bad reputation. By the 1990s, in fact, the broad SD agenda had already started to consolidate, and mining was clearly lagging behind other industries. Thus, a case emerged internally for coordinating sectoral action. In 1998, Rio Tinto played the leading role in launching the Global Mining Initiative (Citigroup 2006), an ambitious worldwide industry initiative to embrace sustainable development that would become the key milestone for this paradigm shift in mining (Brigg 2000). Beyond the company's willingness to be seen as a good neighbour, there were some other fundamental drivers for becoming the SD champion industry-wide. Rio Tinto has never been timid in arguing that, in fact, at the heart of the SD debate was the financial performance of the industry (for instance, Leggatt 2002). Against popular wisdom, few mining companies have consistently achieved their cost of capital in recent decades – as a group, in fact, the mining industry had destroyed shareholder value (Humphreys 2000). For that reason, '[…] the Corporate Social Responsibility agenda should be about managing risk'. In essence, '[it] is a contemporary manifestation of what we used to call 'enlightened self-interest' (Wilson 2001 p5). Humphreys also claimed that:

> *'Addressing the legitimate interests of a wider range of stakeholders […] has little to do with philanthropy and everything to do with competition. [The way] mining companies perform at a local level will be a key factor in determining who gets access to the best mining opportunities in the future. Only those with good truck records globally will be able to raise the finance, gain the permits and command the public trust that future success in the industry will require'* (Humphreys 1996, p23)

In the same line of argument, Wilson claimed that:

> *The bottom line is to add value by integrating SD concepts and solutions into all operations, products and opportunities. If done well, this will fulfil the business case of retaining the Group's licence to operate, improve economic, social and environmental performance, achieving reputational capture and differentiating the Group from its peers* (Robert Wilson, in Leggatt 2002 p13)

Moreover, Rio Tinto currently proclaims to have identified SD as the key to unlocking some of the most challenging problems faced by the industry (Clifford 2005). For mining, there are conflicts between economic, social and environmental objectives which require complex trade-offs between these component aspects of SD. In theory, these conflicts should be resolved by national and regional governments, although many of them lack the mechanisms and institutions to do so appropriately. While companies tend to prefer that a large part of the mining proceeds accruing to host governments be directed to communities close to their mining operations, it remained the responsibility of host administrations to decide how their revenues should be distributed in their own country. Against this background, SD proposed a governance structure that included the community and the industry working together at different levels of government (Rio Tinto 2006b, 2007, 2007b).

In practical terms, the Group developed a public statement of business practice called 'The Way We Work' (Rio Tinto 2005), which includes overarching company principles in the field of SD and Corporate Social Responsibility (CSR). In line with this corporate constitution, the Group set out its key goals for sustainable development in 2000 (Rio Tinto 2001), introducing a number of policy guidelines with these regards, and requiring all Rio Tinto businesses to:

- Determine what sustainable development means for them, identifying implications, risks and opportunities;
- Engage with those affected by their activities and examine what measures, targets and reporting systems are required in each place;
- Include sustainable development principles in their business plans and decision making processes, and
- Investigate how economic, social, environmental, and governance issues can be integrated in their specific contexts.

Rio Tinto's claim that SD should be seen as a '*global concept with local meaning'* has favoured the adoption of a decentralised management of these issues. While general values and responsibilities are developed under an umbrella of corporate principles to ensure consistency across the Group, operating responsibilities remain by and large the mandate of local management at each business unit. For this reason, SD performances are monitored and reported at the local level principally. Rio Tinto claims that all its managed businesses have developed locally relevant sustainable development metrics, in accordance with specific circumstances and SD related priorities, which are identified through permanent consultation with local stakeholders (Rio Tinto 2006b, 2007). The company asserts that SD is not one other area of competence for management to deal with, but rather a new and structurally different way of approaching business throughout, and thus, it has affected the businesses horizontally at every operating level. In ensuring the process is spread evenly across the Group, each business managed by Rio Tinto has appointed a sustainable development champion to coordinate sustainable development policy implementation throughout (Rio Tinto 2006b). In short, the concept of SD generally, and for Rio Tinto specifically, can only take full dimension when contextualised within the specific circumstances of each mine and region. Thus, the next section brings in the Rio Tinto operations that constitute the core of this research.

3.3. Methodology

This research is based on case study analysis. Three parallel studies have been developed which explore the interface between large mining companies and the local and regional economies in which they operate. The case studies are comprised of: a) Rössing, in the Erongo Region of Namibia; b) Pilbara Iron, in Western Australia (WA), and c) QMM, in Fort-Dauphin, Madagascar. The grounds for which these cases have been selected out of more than fifty Rio Tinto businesses worldwide are multiple. First, the choice includes three mines operating within diverse economic, demographic and cultural backgrounds; two African countries – one of them, Madagascar, with extremely low income levels–, and Australia, a high income nation. While all three Rio Tinto businesses currently claim to operate under the umbrella of SD, for one reason or another, they face particular challenges with regards to their economic impact at the local and regional levels, and these challenges are set to play a significant role in the future finances of these operations. The company's case for addressing issues of economic development appears to be particularly evident here.

Second, all three operations have expected a substantial capital investment boost. This would represent an extra stimulus to the communities involved, as part of this corporate expenditure will necessarily spill over the regional economies. This brings with it a unique opportunity to explore how these companies applied SD principles and further development strategies to maximise the effect of this new spending in the surrounding economies. Finally, it is noted that the interface between mining and the broader economy often assumes strongly different characteristics, according to markedly unique stages throughout the life of a mine, which means that the emerging threats, challenges and opportunities in terms of promoting economic development will expectedly fluctuate significantly. The selected cases coincide with the three most distinctive phases in the life of a modern and large scale operation: (a) approaching and planning for closure and decommissioning; (b) full operation, business consolidation and expansion, and (c) the process of planning, mine design, pre-inception stakeholder negotiations and construction.

In developing these case studies, this research relied on both primary and secondary sources of information. As far as possible, the studies have been structured in comparable ways, starting by introducing the context to the broader economy, and continuing with a detailed analysis of the past, present or projected economic contributions of the operations; a thorough look at the local and regional economies since the arrival of mining; and a further focus on the interaction between the mines and the communities. In all cases, the key SD challenges faced by the operations, as well as the strategies proposed to answer them, have been singled out and analysed in depth. This discussion has also been illustrated by first hand commentaries from relevant individuals from both the operations and local communities. It is noted that the QMM analysis slightly distanced from this proposed structure though, as the business was not yet in operation at the time the study was conducted. When difficulty in obtaining strong quantitative data locally has prompted circumstantial departures from this general approach, this has been noted in the text.

Corporate data was provided by various departments in each of the Rio Tinto subsidiaries, principally from Finance, but also Tax, Procurement and HR. In several occasions, additional information was provided by the Rio Tinto Head Office, in particular the Rio Tinto Economics Department. The base year for these analyses is 2004, although snapshots on other periods have also been used, and these have been indicated in each case. In particular, the study on Rössing relied extensively on time series analysis to explore the evolution of monetary contributions up to closure, and in these cases, the Namibian currency (N$) has been expressed in 2001 terms unless otherwise noted. In Pilbara Iron, monetary values were expressed in Australian dollars of the day, which have been frequently converted into US dollar equivalent for ease of reference. In QMM, estimates of monetary contributions were expressed in US dollars of the day, to maintain consistency with the impact evaluation methodology used jointly by Rio Tinto and the World Bank. The relevant exchange rates and deflators used throughout were provided by the Rio Tinto Economics Department. All customary references have been included throughout.

Good quality information on the local economies has in cases been elusive, and thus numerous different sources were consulted. In general, contextual national and regional data has been sourced form Central Bureau of Statistics, both in the case of Namibia and WA. The main multilateral organisations provided most information on Malagasy national figures. Locally, most Town Halls and Shires consulted in the Erongo and Pilbara regions have been cooperative, and their contributions acknowledged all through the studies. Given the regional significance of mining in WA, Input/Output (I/O) analysis was introduced in the case of PI to understand the relative importance of different industries and the interactions among different economic sectors. This analysis helped determined output, income, value added, and employment multipliers, useful to assess the potential degree of diversification in the economic base of the Pilbara economy. While the Australian Bureau of Statistics (ABS) produces I/O tables for Australia, they do not produce state or regional tables. In 2005, Rio Tinto commissioned the production of I/O tables for Western Australia and the Pilbara, based on existing national tables (Acil Tasman 2005). This research has built on that work, while all original tables have been included as appendixes. Finally, the case study on QMM could be characterised by a strong liaison between the company and development organisations, and so it has relied on data from the World Bank, USAid, the UN and others to a large extent. In all cases, universities and several other knowledge centres were thoroughly consulted.

Feedback from various interviews with company executives, government officials, local entrepreneurs or community members was incorporated to complement the quantitative data mentioned above. The interviews were conducted in a conversational style, and prescriptive questions were avoided. Interviewees were encouraged to speak openly about their personal experiences and to give their impressions of the companies and the changes they brought to local communities, both positive and negative. Hence, these conversations allowed the recording of sentiments with regards to the mine, the economy, the community in general – or certain sectors within the community in particular[36]. Date, affiliation, role, and length of participation in the communities were also recorded. Most interviews were

[36] The interviews were solicited on the basis of a contribution to an independent research only and, as far as possible, the researcher's identity as a Rio Tinto employee was concealed to avoid conditioning responses. This was not always possible though, and a few interviews could only be facilitated through Rio Tinto and called for the presence of a Rio Tinto employee (e.g. CEO Municipality of Swakopmund etc)

conducted in person, while a few follow up discussions took place over the phone. Only relevant observations were incorporated, and thus comments from 28 out of a total 33 interviews were finally represented in the text. The study in Rössing incorporated comments from nine interviews, all conducted between 2004 and 2007. In PI, feedback from 8 conversations were included, all taking place in 2005. In QMM, interviews were carried out between 2006 and 2008. Notes from 13 interviewees were incorporated into the study. Most meetings took place at the respective sites with the exception of 1 in Johannesburg and 3 in London. All commentaries have been clearly referenced in the text.

3.3.1 The case studies

The three case studies in this research are written as stand alone pieces. General and comparative lessons from these mining operations, a link back to the literature, and overall research conclusions, are therefore discussed altogether in chapter 7. Following is an introduction to the key features and challenges of each case.

3.3.1.1 Planning for closure: Rössing, the Erongo Region, Namibia

The Rössing Uranium mine (RUL) is located near the West coast of Namibia, in the Namib Desert. At the beginning of the new millennium Rössing was the fifth largest producer of uranium in the world, contributing 6% of global production – equivalent to 2,643 tonnes. The economic impact of Rössing nationally has been very significant in the past, and although it has declined substantially since inception, it continued to be important. In 2004, the operation accounted for 10% of total exports in the country, and its value of production was equivalent to 3% of GDP. At the same time, however, negative market conditions placed Rössing at a turning point, at which the mine was pressured to decide either to expand the operation until 2016 or 2022, or face early closure in 2008 (Rössing 2006).

During 2005, the price of uranium went up considerably driven mainly by significant declines in the stocks held by nuclear generators, especially in the US. The Mining

Journal (2005) has argued that there are currently serious limitations to the expansion of uranium supply from existing sources, and since generators' demand is relatively unresponsive to price, it has been expected that high prices will continue in the mid- to long-term. This rapid increase in the price of uranium was, however, counterbalanced by the steady appreciation of the Rand against the US dollar. As operating costs are nominated in US dollars, an appreciation of the South African Rand – the currency to which the Namibian dollar is pegged- has had a negative effect on the company's finances. Nonetheless, (and partly in an attempt to gain time to prepare for closure), towards the end of 2004 the Rio Tinto Board finally decided to expand the operation.

In any case, this period of uncertainty about the future of the mine, as well as the company's reactions during this transition, has provided a unique environment to study the potential effects of decommissioning Rössing and to estimate its economic implications. Moreover, as the decision was made for the mine to expand, the company decided to continue with the closure studies underway and to put in place programs and projects to tackle these emerging challenges within a newly defined target for closure, initially set for 2016. In parallel, the central government reacted to the news of a potential shut down of the mine with great concern, and it engaged in discussions with the company in an attempt to keep it open. While the effect of decommissioning the operation at the regional level was particularly worrying for the government, there has been no financial commitment from the central administration to support the local economy during the transition. Pressure mounted on the company to deal with these challenges directly.

By 2004, Namibia was a middle income country with a GDP per capita of just over US$2,000. Income distribution is heavily skewed, however, with a Gini coefficient[37] of 0.7 (UNDP, 2004), and extremely high unemployment and social exclusion. Namibia still relies heavily on the primary sector, although it has been diversifying towards a less mining-dependent economy since the early 1990s. During this time, the services and manufacturing sector, principally meat and fish processing, accelerated notably compared to the evolution of mining (at least until the worldwide mining

[37] The Gini coefficient fluctuates from 0 to 1, with 0 being a completely equal distribution of income. A Gini coefficient above 0.55 is considered very unequal.

boom that started in 2003). Following independence in 1990, the country embarked on a process of economic restructuring aimed principally at securing macroeconomic stabilisation. As part of this economic plan, Namibia joined the Common Monetary Area with South Africa and started a process of economic deregulation, which paid off with a downward trend in inflation.

Ever since inception, the company has invested heavily in improving the social services, amenities and infrastructure at the local level – defined as both a medium-size town where most skilled employees currently live, Swakopmund, and a small mining town nearby the mine, Arandis. The way in which the operation has done so varies significantly; from the contributions directly taking place through its business activities – like payments to employees – to the establishment of an independent development foundation, the Rössing Foundation, to which the company effectively outsourced a large portion of its community investment strategy[38]. Rössing has impacted the local economy in dissimilar ways, and while the economy of Swakopmund has been relatively successful in diversifying, the prospects for Arandis have always been closely tied to the mine.

As a costal town 65km from the mine, Swakopmund became well established as a holiday destination in the 1940s. A large demand for accommodation developed towards the end of the 1960s, mainly as a tourist destination, and another expansion took place after the mine's inception. Although the mine still plays a fundamental role in its economy, Swakopmund seems to have slowly diversified into commerce and tourism, and to some extent, manufacturing (Rössing Annual Review 2005). In contrast, Arandis was established and developed as a mining town in the mid 1970s, and has historically housed semi-skilled and unskilled mine employees. After many years of economic duress due to the company cutting down its social programs because of negative market conditions the ownership of Arandis town was transferred to the Government in 1992, and it was declared an independent town with an elected local authority in 1994. Its population has since been declining steadily (The Rössing Foundation website).

[38] In 2001, for instance, total community expenditure by RUL was N$15.8m, 93% of which went to the Rössing Foundation. By 2004, RUL's contributions represent around 1/2 of the Foundation's financial resources.

Closure raises very particular economic issues for host economies. In Namibia, the substantial debate around these questions has also pressured the government and civil society into considering alternative economic strategies for the day after mining. Meanwhile, Rössing has vowed to approach these issues within the framework of sustainable development, position that was explicitly reflected in the company's Closure Standard (Rio Tinto 2004). Efforts have concentrated at securing the quick diversification of the economy in the areas most sensitive to closure, and a multi-stakeholder approach has been favoured for dealing with these challenges. Community development strategies put in place aimed at empowering the local population, for instance, developing entrepreneurial skills, and supporting alternative business activity more generally. In addition to understanding the interface between Rössing and the local and regional economy, this case study investigated the key challenges and options faced by locals, and the management responses that were put in place as a result. The study also explored the chances of these strategies succeeding.

3.3.1.2 Full operation and expansion: Pilbara Iron in Western Australia

Pilbara Iron (PI) is a world-class asset manager that operates and maintains mining, rail and export facilities in the Pilbara region, northwest of Western Australia (WA). It is, in effect, the largest business unit in Rio Tinto, with a total turnover of US$2.2 billion in 2004. The company was established in 2004 to facilitate closer cooperation between Hamersley and Robe – two independent Rio Tinto Group iron ore operations in the Pilbara region – which have undergone major restructuring and expansion, with enormous consequences for the regional economy. The full enterprise comprises a network of ten mines, three shipping terminals, the largest privately owned railway in the world, the power supply system, and several mining towns. In 2004, Pilbara Iron handled more than 130 million tonnes of iron ore (Pilbara Iron 2005).

The Pilbara region covers over 500,000 square kilometres and is sparsely populated by nearly 40,000 people. The area comprises the three Shires of Ashburton, Roebourne, and East Pilbara, and the Town of Port Hedland. The major towns of

Port and South Hedland, Karratha, Newman, Paraburdoo and Tom Price accommodate approximately 70% of the population. The remainder of the population live in smaller towns, in remote pastoral and mining locations, or in Aboriginal communities. The PI towns are located in the Shires of Ashburton and Roebourne (Pilbara Iron 2005). The State government's vision for the Pilbara towns is that of sustainable and independent communities, underpinned by a strong and diversified economy (The Pilbara Development Commission 2006), and Pilbara Iron have publicly adhered to this vision. With a gross turnover of US$2.2b there is no doubt that Pilbara Iron is an exceptional contributor to the economies of both the Pilbara and the State of WA.

However, a key criticism of mining put forward, for instance, by the World Bank Extractive Industries Review (WBEIR 2003) was that few benefits accrue at the local level. This same criticism has been frequently levelled at Pilbara Iron. The Pilbara community exhibit strong signs of social compartmentalisation. Three communities coexist with minimum interaction. At the top in socio-economic terms are the mine workers employed by Pilbara Iron. Mine workers tend to be better paid and housed than those employed either by government or by PI suppliers and other businesses. At the bottom is the Indigenous community. This compartmentalisation has worked against diversifying the regional economy and appeared to be responsible for notorious social tensions locally (URS 2005).

The Pilbara Towns were established under various State Agreement Acts during the 1960s and early 1970s. When Hamersley Iron and Robe initially built the towns, the companies had full control and responsibility over all aspects of town management, maintenance and development, and were thus classified as 'closed' towns. During the 1980s, a process of so-called 'normalisation' commenced during which State and Local Government authorities started to assume responsibility for standard functions in each community. This has proved to be a gradual and irregular process though. Quite distinctive geographical, political and socio economic conditions in the Pilbara explain the enormous difficulties faced by these towns along this process, including:

1. The gross regional product per capita (A$114,625) is much higher than Perth (A$34,593), the State capital, though little value remains in the region (Taylor

and Scambary 2005);

2. 97 % of the region is classified as very remote. The large distances between communities reduce the possibilities of a regional approach to infrastructure provision. This also allows monopoly pricing by some suppliers, hence increasing infrastructure management costs (Piper 2005);
3. Overall prices for goods are 11.3 % higher than in Perth and median housing prices are far higher than the WA average (URS 2005);
4. The non-Aboriginal population has been in decline since its peak in the mid-1980s. Although there has recently been an important inflow of people into the Pilbara, this has been primarily linked to a construction boom and thus not assumed to be a lasting trend (Taylor and Scambary 2005).
5. The proportion of the Indigenous population is increasing (from 12 per cent in 1991 to 15 per cent in 2001), largely as a result of the total population declining (Taylor and Scambary 2005);
6. There is a lower average unemployment rate (4.3 %) compared with the regional average (6.2 %) and that of Perth (6.6 %), thought this is because unemployed people do not remain in the Pilbara. Indigenous unemployment is appreciably higher (Taylor and Scambary 2005);
7. Recruitment and retention of qualified staff, both by the mining industry and other activities, is increasingly difficult (CMEWA 2005);
8. A declining population results in serious challenges in maintaining a consistent ratepayer base in the Shires;
9. Township infrastructure is aged, and in many cases has exceeded its design life – high levels of capital investment would be required to refurbish present infrastructure inventories (Piper 2005);

The history and present status of normalisation across the towns varies considerably. Together with broad company and local authorities' initiatives to progress normalisation in some towns, there have been some demographic and structural changes which have, in some cases, resulted in increased levels of private home ownership and the development of more diverse communities. This is particularly evident in coastal towns (Piper 2005). However, unresolved normalisation processes with mining companies result in a situation where all stakeholders are limited in their ability to implement effective long-term planning. Some commentators have argued that, so far, normalisation has been mainly seen as a financial process involving companies handing over assets, and the means for their maintenance, to the Shires.

Looking forward, given the demographic and revenues baseline of most of these towns, it is challenging to envisage the emergence of sustainable and independent communities underpinned by a strong and diversified economy, as proclaimed by the government (Pilbara Development Commission 2005, 2006) any time soon. Within this context, how has a commitment to sustainable development by this expanding business impacted on the towns and communities? On the one hand, this case study focussed on the monetary flows and overall economic contributions from the company's business activities to the broader economy. On the other hand, it explored the impact of these contributions on local and regional communities, and looked at how the broader economy has coped with such stimulus up until now. The study also analysed the regional linkages between mining and the rest of the economy, and assessed the degree of diversification possible in these types of economies.

3. 3.1.3 The mine of the future: the QMM project, Fort-Dauphin, Madagascar

Since the mining industry's embracing of the concept of sustainable development in the late 1990s, most efforts and initiatives by the industry in this regard have been applied to existing operations, or brown-field developments. For the most part, companies tried to implement new operating systems and processes to reflect their commitment to this new approach. In contrast, QMM is among the first projects of its kind that has been fully designed and brought about as a pure example of the sustainable development model in the extractive industries. As such, the enterprise was proposed not just as a mining operation but as a catalyser of broader regional development. While some have argued that this repositioning of the project was to some extent a corporate response to enable a commercially challenging project, the new approach has had an undeniable impact on the way in which the enterprise was to be structured, the dynamics around the key stakeholders involved, and also the way in which it was to impact the economy in the long run. The project started production as this research was coming to a conclusion, and so its ultimate effect on the region remains undetermined. The focus of this study is therefore on the process leading to the inception of QMM, its approval by Rio Tinto, stakeholder negotiations and the construction stage.

The QMM mine is located near Fort-Dauphin, in the Anosy region, southeast of Madagascar. A general background to this region is critical for understanding the distinctive features of this mineral development. Anosy has one of the most deprived economies in the world, yet it is endowed with a number of comparative advantages that have suggested to many development practitioners the existence of significant latent potential for rapid growth. Some of its key socioeconomic characteristics are introduced below (mostly from World Markets Research Centre 2005):

1. In 2004, the regional per capita GDP, or GRP, was estimated at $180 by inhabitant whereas the national average was about $210 per capita;
2. The self subsistence economy predominates in the Anosy Region; while the region has favourable climatic conditions, the product output per unit remains very low mainly because of low productivity;
3. Fishing activities spread out over 194 km of coastline but remain limited to the export of relatively small quantities of lobsters and shrimps. There is potential for industrial exploitation of tuna and sardines though these have been destined exclusively to local consumption so far;
4. The Anosy Region has enjoyed a remarkable engagement of local associations and NGOs, often gathering hundreds of members and activists, including bi- and multi-lateral partners including USAid, PAM, Médecins Sans Frontières, Aide et Action, and many more. As positive outcome of this engagement, since 2004 the region has seen the average rate of schooling increasing to a promising 76%;
5. Yet, the socio-sanitation infrastructure of the area is still highly deficient and 80% of the population does not have direct access to drinking water; 16% of the population suffer from serious respiratory diseases; literacy stands at less than 20%;
6. Only 50% of roads are passable, with the rest either closed down during the 9 months of the rainy season or simply inaccessible all year round. Six ships wrecks litter the coastal landscape as a reminder of the need for a proper

harbour. As a result, the level of trade and movement of goods and people remains precarious.

7. With regards to the environment, the Anosy region used to have vast wooded areas as well as waterfalls, extensive lakes, and geothermal sources. However, 65% of the watershed slopes are today highly degraded. The practice of brush fires has also caused sediment deposition in lakes as well as in parts of rice plantations, river mouths and some lobsters and shrimps nesting grounds

On the company side, QMM is an industrial mineral (ilmenite) project managed and controlled by Rio Tinto, although the government of Madagascar has a 20% stake in the business. Rio Tinto's technical evaluations indicated the potential for a high grade, long-life and relatively low-cost operation. However, the company identified the extremely precarious condition of the existing infrastructure in the region as one of the key challenges faced by the project. In particular, the business depended on the construction of a deep-water port in the vicinities of the mine. The cost of the port was estimated at US$140 million. The impact of this upfront disbursement on NPV jeopardized the economics of the project. In addition, as the project evolved, it also became apparent that this lack of infrastructure constituted a restriction for economic development more broadly. Gradually, then, the following rational started to consolidate: if the proposed mining port could be turned into a multipurpose facility, it would be reasonable to seek financial contributions from the economic agents expecting extensive appropriation of the positive externalities that would arise from this investment.

These circumstances paved the way for a strategic alliance between QMM and the World Bank and other development partners. The Bank would enable the project by contributing towards the financing of the port as long as the project demonstrated strong potential for broader economic benefits. The viability of this project was, as a consequence, associated to its capacity to ensure it will deliver regional economic development in addition to the expected financial returns. This constituted a clear business case for engaging in areas of accountability that have been up until this point beyond Rio Tinto's direct business activities. As part of this engagement, the company supported the establishment of an innovative and participatory institutional architecture with the mandate to lead an ambitious economic development process in the region, in which mining was meant to play only a complementary role. Based on these efforts, the World Bank made a decision to underpin this development. On its part, in late 2005, Rio Tinto announced the approval of the QMM project, thus committing to the largest foreign direct investment the country had ever received up to that point. This final case study explored this process in detail.

3.4. Summary and final remarks

The beginning of this chapter argued that an increasing demand for minerals and metals worldwide has accelerated exploration efforts by mining companies in developing countries, with the expectation that the discovery of high quality, large mineral deposits will offset the negative impact on the economics of projects resulting from riskier investments (Citigroup 2006). A new tier of producer countries are also expected to be those sustaining demand growth in the years to come (including China, India, Brazil and Russia), a role most typically attributed to the US, Japan and Europe in the past (Humphreys 2003). Meanwhile, attracted by the prospects of high mineral revenues, many of these potential mining countries started to rewrite their mining codes (Otto 2002). This new geographical pattern will affect Rio Tinto particularly: considering its current portfolio, the challenges emerging from these changes may be larger for the Anglo-Australian mineral producer than for most of its key competitors. Expectedly, these circumstances will put pressure on the company to revisit the established methodologies for evaluating business investments in the developing world, as well as to readdress issues of economic development more widely.

While it has been an unequivocal reference for the mining industry, Rio Tinto had long been blamed for overlooking its impact on the surrounding environment, particularly in the developing world. This reputation started to change most notably in the last decade, when the company became the visible champion of SD in mining, and placed itself at the forefront of the Global Mining Initiative (Citigroup 2006) – through which the industry claimed to have shifted towards more sustainable means of mineral production (MMSD 2002). Although there has been a noticeable swing from the ecological to the economic implications of mining at the regional level, the latter have been somewhat less articulated than the former (for instance, Humphreys 1996). This is, to a large extent, because an important part of the regional economic development agenda has typically fallen outside of the industry's direct mandate. In this sense, Rio Tinto has claimed that SD should be seen as a whole new way of approaching mineral production, whereby a deep reshuffling of the previous allocation of responsibilities now favours a strong collaboration between companies, local governments and civil society.

A decade has now passed since this plea was launched by Rio Tinto – and embraced by the biggest players in the industry. Attention should now be focussed on whether the fundamentals that prompted the emergence of this movement have been successfully addressed, and to explore whether this agenda has overcome the problems identified in the previous model of mineral development in terms of the opportunities for local supply-chain growth, the local labour force, the reinvestment of mineral revenues locally, and the communities' ability to respond to the changes brought in by mining more generally (Radetzky 1994, Stongman 1998). In essence, a new set of questions are starting to ask what is today the economic effect of a large mining company at the local and regional level, and whether a large-scale mine can catalyse economic development more broadly. Most of the specialised literature, however, points to the futility of one-size-fits-all approaches, and asserts, for instance, that the impact of producing and transporting low-value-per-tonne industrial minerals is not comparable to that of precious metals; that a mining operation in North America is not equal to one in Southern Africa; and that the effect of a mine in a semi-urban district is hardly similar to that in an isolated location (McMahoney 2001, MMSD 2002). Thus, in addressing all these questions, this research attempted to identify and examine both communalities and specificities arising from three cases at dissimilar stages in the life of a mine, in a variety of geographical and economic contexts.

In the first study, Rössing was confronted with the threat of closure. This provided a unique basis for studying the handing over of company-built infrastructure to communities, the possibilities of weaning off economic dependency on mining, and diversifying the economy. It also provided a chance to look in detail at the distribution of mineral rent, including a geographical examination of capital flows throughout the years. Second, PI offered an opportunity to look into one of the largest mineral developments in the world. Key questions revolved around the financial and social sustainability of local communities due to low population and a declining revenue base. The expansion of mining is likely to put pressure on infrastructure and aggravate social conflict, principally evidenced within Aboriginal communities. Looking into the dynamics of the economy of WA contributed to understanding the scope for downstream beneficiation in this type of environment. Finally, the study of QMM explored a new and holistic way of conceptualising mineral developments, where regional planning is at the core of the design process. As opposed to the previous models, the distribution of mineral rent appeared to have been addressed upfront and in a participatory fashion. This also allowed for documenting the building up of new structures of regional economic governance. On the other hand, the project risked altering the population structure dramatically, and increasing the menace of epidemics, famines and social unrest.

This analysis started by exploring the key current theoretical views on economic growth and regional and local development, to then focus on how some of these concepts applied to mining throughout history, including the more recent adoption of SD by the industry. The current chapter introduced Rio Tinto and investigated, at a high level, how the company shifted from a paternalistic approach towards communities to what it has been referred to as a bottom-up, region-specific, long-term and plural-actor based approach. The rest of this research dug into the specifics of this shift. In particular, it sought to answer questions of regional economic governance and institutional frameworks; local revenue management; public/private engagement in development policy-making; the availability and constraints of development capital at the regional level, or the development opportunities for small and medium enterprises in remote communities, to name just a few. While the microeconomic literature has been increasingly looking into these factors, it has rarely done so in the context of regional mining economies. In this regard, the industry's embrace of SD offered an opportunity for considering them vis-à-vis the effects of large mining enterprises. The next chapter introduces the case study on RUL, while chapters 5 and 6 cover the studies on PI and QMM, respectively. As mentioned already, chapter 7 compares the key messages arising from each of these studies, links them back to the literature, and discusses the main lessons from this work.

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Chapter 4

Planning for closure: the economic legacy of Rössing

4.1. SD and the challenges of closure

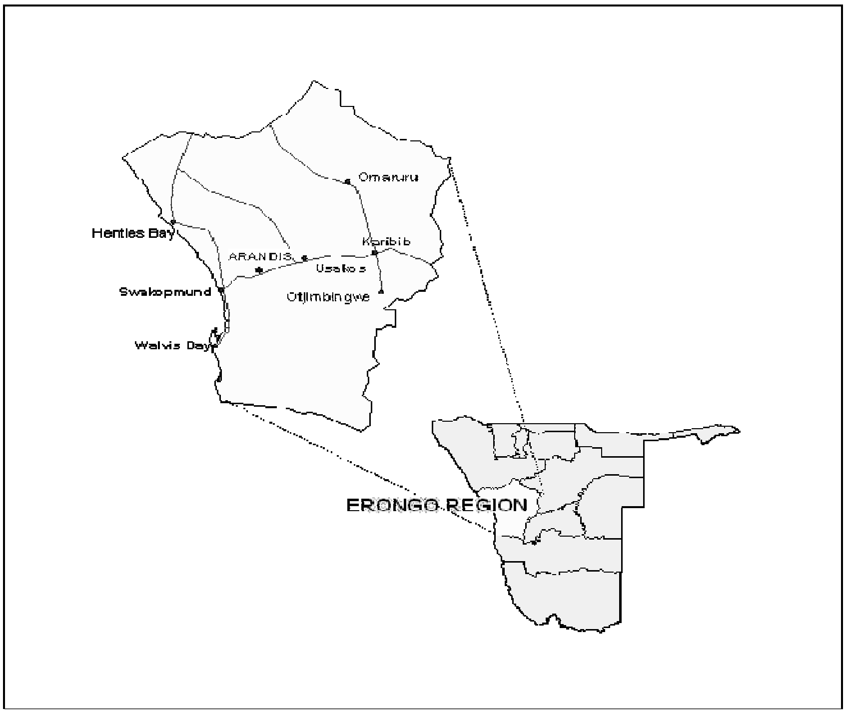
The mine that is the subject of this study, Rössing Uranium Limited (or RUL), is located in the Erongo region, Namibia. Regionalism, however, is a relatively new concept for Namibia, which was split into regions only after independence only two decades ago, and as such, its regional administrative capacity is still in formation (MRLGH 1997, 1998). The study will therefore focus on the local level, defined here as the towns of Swakopmund and Arandis. Since the mine's inception, the company has invested heavily in improving the social services, amenities and infrastructure of both municipalities, which is where the vast majority of employees reside (Figure 4.1). Swakopmund was originally built as a tourist destination and has since been expanding steadily, although often linked to the ups and downs of mine production. Arandis, 5 km from the mine, was built instead as a traditional industrial town along with the development of the mine. In 1990, however, Rössing had to trim down its community programmes in the town due to negative market conditions; in 1992 the ownership of Arandis was transferred to the Government, and in 1994 it was declared an independent town with an elected local authority.

Years of financial duress left Rössing at a turning point in 2004, when the company had to decide either to expand the operation or face early closure in 2008. As the company started to consider the prospects of closure, this soon triggered serious concerns that such an event could have quite dramatic implications for the communities (Rössing undated, SIAPAC 2004). Closure poses fundamental economic challenges, including the effects of a drastic cessation of significant financial flows into an economy, the often consequential inability of local and regional administrations to generate sufficient revenues as to cover the cost of running their jurisdictions, or constrains in the human capital necessary to sustain alternative economic activities, to name just a few (Kahn et al 2001). Would the economies of Swakopmund and Arandis be able to sail through the storm of closure safely? How prepared was the company to take on these challenges at a time of financial difficulties, and, in any case, would it be able to secure a smooth transition towards economic sustainability?

A key challenge faced by the SD model in mineral rich economies consists of how to apply the concept of sustainability to an economic activity that appears to be intrinsically unsustainable; sooner or later exploited mineral bodies deplete, at which point mining companies will pack up and leave (Humphreys 2000). From an economic point of view, the argument brought forth by the SD movement is that the focus of this dilemma should not be on the cessation of the income flowing into the economy but on the utilisation of the mineral wealth during the life of the mine, to ensure that, at closure, these flows of capital had been successfully transformed into other forms of capital to allow the consolidation of long lasting sources of income (for instance, Davis 2000; Humphreys 2000, 2000b). This view of sustainability considers that the economic benefits created by mining can be sustained in time through proper investment, creating wealth after a mine has gone. Good economic management should thus help convert finite mineral resources into long lasting sources of human well-being. Assessing the economic legacy of a mine, – as is the aim of this study -, should thus look at the accumulation of economic impacts since inception, but also at the changes and adjustment undergone by the impacted economy during this time.

Figure 4.1 – Map of Namibia and the Erongo region

Source: RUL



From early on Rössing pledged to address all issues related to the decommissioning of the mine within the framework of sustainability, in line with Rio Tinto's stance on sustainable development[39] (see chapter 3 for more on this). Numerous studies were conducted at this stage in an attempt to understand the key implications of closure in this specific context. A fundamental question was how to implement a transition strategy in the few years available before closure, initially scheduled for 2008. Another key dilemma referred to whether the company should attempt to tackle questions of long term economic governance or, for instance, issues related to financial town management, which have been typically beyond the company's mandate and area of accountability. Chapter 2 explained how some mining companies have tried to circumvent this conflict by decentralising their community initiatives into independent institutions like foundations, special funds or trusts. (Kunanayagam 2003, Yakovleva et al 2004). Established in 1978, the Rössing Foundation (RF) was an early example of this in Africa. More recently, indeed, the Foundation was charged with the task of dealing with the key economic risks emerging from this transition.

As anticipated in chapter 3, towards the end of 2004 RUL escaped closure and embarked instead on an ambitious expansion program. While decommission was then postponed, the serious considerations given to this matter left a deep mark in most stakeholders involved in this process, and encouraged the definition of the carefully articulated closure strategy currently embraced by the company. There was a general consensus that the challenges posed by a transition to a diversified and sustainable economy would require financial resources, but perhaps more importantly, time. Rössing's doors will now remain open at least until 2016. The process undergone has provided a unique opportunity to study the risks, threats and opportunities that closing a big mine can pose on the surrounding economy. In starting to explore this, the rest of this section briefly reviews the chief characteristics and trends of the broader economy. Given the relative size of the Namibian economy – and considering the embryonic stage of the regional institutions (MRLGH 1997 1998) -, this contextual overview is held at the national level.

[39] Rio Tinto was starting to prepare the Rio Tinto Closure Standards, in accordance with the company's SD approach, at the time in which Rössing began to evaluate the possibility of closing down, in 2003

4.1.1 Mining and the Namibian economy

The Namibian economy has gone through a period of macroeconomic stabilisation following independence in 1990. A characteristic feature of this period was the membership of the Common Monetary Area (jointly with South Africa) followed by a downward trend in inflation and economic deregulation, which assured important inflows of FDI and the expansion of the business sector, in particular services (finance and telecommunications). Namibia is considered a mid-income level country (US$2,300 per capita in 2004), though its level of wealth distribution is regarded as highly skewed, with a Gini coefficient[40] of 0.7. It still has very high levels of structural unemployment (above 30% in 2004) and social exclusion, with more than 55% of the population living on less than US$2/day[41] (World Bank 2006). The productive capacity of the economy is based mainly on the primary sector, principally mining, fishing and agriculture. While Namibian products currently experience good demand in their export markets, the country's dependence on primary exports has made it vulnerable to world market fluctuations. The primary sector contribution to GDP is still near 25%, although it has been declining steadily over the last two decades.

Namibia is a relatively small economy with a GDP of US$5.5 billion (2004). The primary sector is still dominated by mining, though the uranium industry in particular (RUL, effectively) has declined consistently, both in relative and absolute terms, following a dramatic price decline in the global market in the early 1990s. The fishing sector has evolved firmly in the post independence years, outdoing the uranium sector in terms of contribution to GDP. This was mainly due to improved oceanic conditions, which allowed for increased total catches, but also to better policies[42] and sector restructuring. Local analysts believe, however, that the sector volume is currently at its limit (Batty et al 2005). Agriculture production is too narrow for commercial purposes, though still provides a means of subsistence for 70% of the population.

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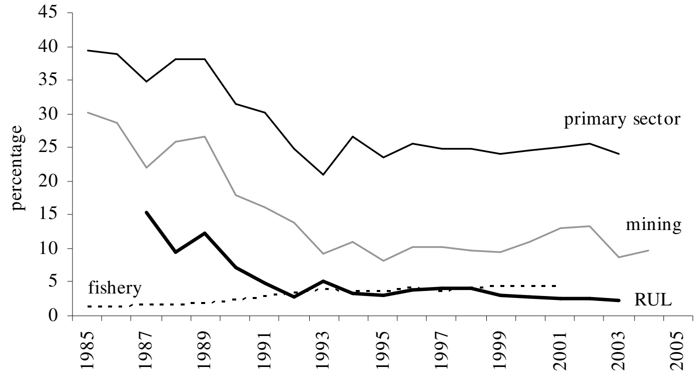
[40] Gini coefficient is a widely used measure of income distribution, which can fluctuate from 0 to 1, with 0 being a perfectly equal distribution of income. A Gini coefficient above 0.55 is considered very unequal.
[41] 1993 survey
[42] The natural stock was systematically over fished prior independence by foreign ship-factories.

Figure 4.2 – Primary sector contribution to GDP

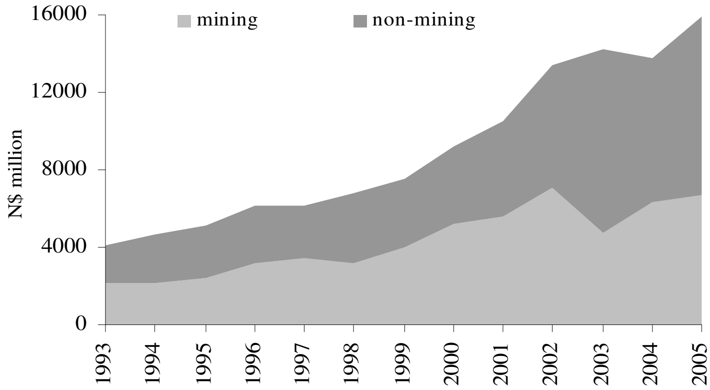
Source: National Accounts, Central Bureau of Statistics, Namibia



The output composition of mining has changed quite dramatically. In 1987 uranium production accounted for 15% of GDP and more than 3/4 of the total mining production value; by the end of the millennium it represented around 2.5% of GDP and less than 1/4% of the sector. The share lost in uranium was gained in the diamond industry. The declining proportion of mining to GDP could be seen as a sign of economic diversification, a trend that is common to South Africa. While mining contributions to GDP in South Africa, (Namibian key trading partner), stabilised at around 6%, mining in Namibia still represents well above 10% of the country's economy (Chamber of Mines of Namibia 2006). Likewise, exports in Namibia have been largely dominated by primary commodities, particularly minerals. There has been a decline in this trend over the last years, however. In 1985 exports from the mining sector represented almost 80% of the total; it is currently around 50%. Uranium exports in particular declined from 26% to 10% of total exports in 1985 and 2000 respectively.

Figure 4.3 – Namibian exports

Source: Chamber of Mines of Namibia



The manufacturing sector has been growing steadily in the last two decades. It still relies to a large extent on the processing of primary products, principally meat and fish, and on the production of beverages and food (Figure 4.2). The very narrow domestic market has often been blamed as a key limitation[43] to the expansion of the sector (NEPRU 1999b, 2000). Although government services remain the largest contributor to GDP, its share dropped towards the end of the 1990s while provision of services by other sectors increased. Following international trends frequently associated with globalisation, the financial services have increased notably in Namibia. One of the most critical issues for the financial system, however, is still the lack of supply of investment finance for the productive sector. The credit allocation is biased towards consumption rather than productive investment[44] (IMF 2002, Shiimi 2002). Tourism has grown extensively over the last decade, accounting for 6% of GDP, and was responsible for 11% of all exchange earnings in the economy in 2004.

Summarising, Namibia still relies heavily on the primary sector, although it has made good progress in changing its economic structure towards a less mining-dependent economy since the early 1990s. In effect, in the decade leading to the global mineral boom that started in the early 2000s, the mining sector grew at a lower pace than services and manufacturing. Yet, manufacturing expansion has mainly concentrated on the processing of primary products and has not diversified into other industries. Equally, services expanded in the government sector and tourism, but minimally in the area of services-to-businesses. Local and international economists have repetitively argued that a further stretch of the financial sector would be highly desirable (NEPRU 1999b, 2000, IMF 2002)

Within this context, RUL has always been a mayor contributor to this relatively small economy. Although this contribution has been declining steadily since the mine's early days, as Rössing faced the prospect of early closure its annual turnover was still equivalent to 3% of the Namibian economy – directly adding nearly1.4% of GDP.

[43] Population in Namibia was estimated in 2,000,000 in 2004, with an income per capita of around US$2,300
[44] The African Department of the IMF sites the lack of competition in the banking sector as the main reason for this.

Nevertheless, (and perhaps not surprisingly), closure deliberations rapidly shifted the attention to the vicinities of the mine, as it was broadly feared that it is at this geographical level that the worst economic legacy of closure would be felt. The rest of this paper is organised as follows: based principally on company's records, the next section focuses on the type (and size) of the economic stimulus generated by the mine since inception, and section three explores the characteristics of the local economy and, particularly, its interface with the mine. Section four attempts to disentangle and quantify the main challenges posed by RUL's closure threat. Section five consolidates a considerable amount of information introduced up to this point, and looks in particular at the key issues around Aradis. The last section presents final reflections on this case study.

The methodology for this research was already discussed in chapter 3. For consistency with the other case studies, the base year for this analysis is 2004. In the company time-series below, the Namibian currency (N$) of the day has been expressed in 2001 terms, unless otherwise specified. For local info, the last census at the time of writing had taken place in 2001, and therefore several other sources of data have been used to fill in the gaps, which have been in all cases explicitly referenced. Direct insights from nine interviewees were included towards the end of the analysis to illustrate conclusions. All interviews were conducted between 2004 and 2007, either face-to-face in the Erongo region or by phone. Interviewees included senior and mid range mine employees, public servants, business persons and residents. Finally, all the analyses introduced here are the author's original investigations unless otherwise noted.

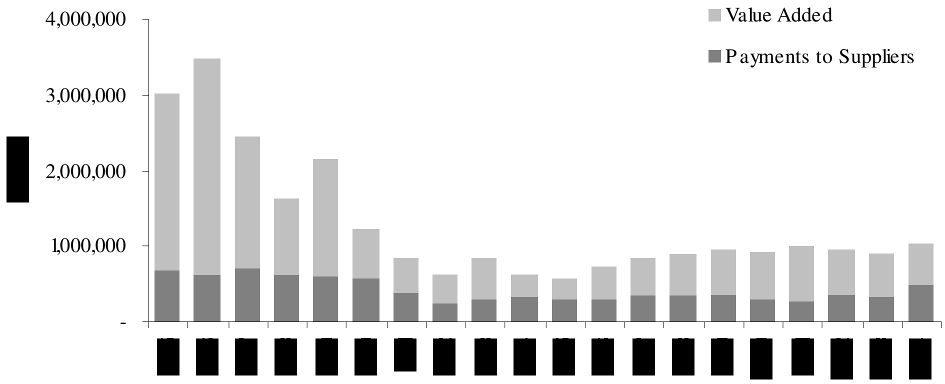
4.2. The economic contributions from RUL

In contrast to the era of commercial inventory accumulation of uranium between 1970 and 1984, when primary production capacity exceeded the requirements of actual plants but still continued to expand in line with expectations of a rapid growth in nuclear power, the period from 1985 to 2003 was characterised by inventory liquidation, driven by a drastic change in the global perception of nuclear energy, and exacerbated by oversupply of Russian enriched uranium from decommissioned nuclear weapons and uranium stocks more broadly (Mining Journal 2004). This scenario has been the context under which Rössing operated for most of its active life, which pushed it into a status of permanent cost-cutting and rationalisation that helps to explain the increasing pressure for early closure. More recently, the decline in inventories held by power utilities and a worldwide surge in demand shifted the previous market to one increasingly production-driven, which allowed Rössing to escape decommissioning. The uranium long-term price assumptions made the unexpected U turn towards the end of 2004; from the low of US$7/pound in 2001, spot prices have rocketed to more than $45/pound (Mining Journal 2006), with long term prices settling at approximately US$23/pound (2007)

Figure 4.4 shows RUL's total contribution to the economy, measured as gross turnover at constant prices (2001). Together with prices, the company's contribution declined pronouncedly during the beginning of the 1990s, then stabilised and slightly recovered over the following decade. Towards the end of the time-series in the figure below, the company had already started to actively plan for closure.

Figure 4.4 – RUL's contribution to the economy over time (N$ of 2001)

Source: RUL – Financial Division



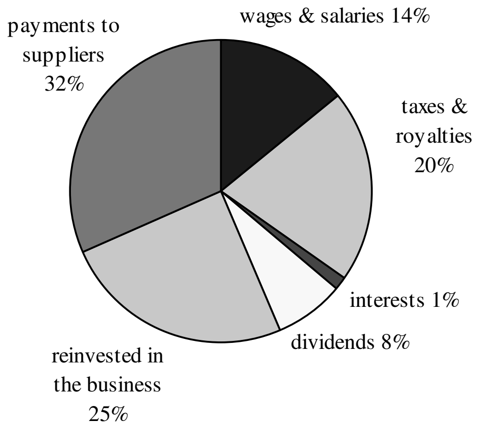
The economic composition of RUL's activities had remained roughly unchanged for at least a decade. Figure 4.5 displays a detailed analysis of these contributions for the year 2001, as an illustration. In that year, RUL's economic contribution was nearly N$1b (US$135m)[45], 68% in the form of value added and the balance in payments to

[45] Exchange rate as per Dec 2003 US$1 = N$7.4

suppliers[46]. The category 'reinvested in the business' entails earnings retained within Rio Tinto for future investment, earnings attributable to outside shareholders, amortisation and depreciation. Note that in this example year, Rössing managed to report some profit, although this had not been the norm during the difficult years prior to 2004. There are significant implications to the local economy associated with this since, as is explained below, several of the most direct benefits from Rössing are, in fact, linked to profits.

Figure 4.5 – Composition of RUL's economic contributions

Source: RUL – Financial Division



The adverse market conditions for Uranium explain two periods of drastic retrenchments by the mine. Total employment decreased from 2,518 to 1,287 in 1991, and then to 810 fte (full time equivalent) jobs between 1998 and 2000. There were approximately 800 direct employees in 2001, virtually all Namibians, and this number remained relatively stable until 2004. As a result, total labour costs (wages, salaries and benefits) declined significantly between 1991 and 1992, and remained relatively constant until the late 1990's. These marked changes in the labour force also impacted on labour productivity statistics, which, despite all the fluctuations, improved significantly over the period (labour productivity is measured here as rock mined per employee). Total volumes mined and employee numbers declined dramatically from 1988. While production rebounded notably, employment remained stable between 1991 and 1998. From then on, productivity growth is predominantly explained by further retrenchments as production volumes started to decline again until after 2004.

[46] Refer to chapter 3 for a discussion on how to measure economic activity

Figure 4.6 – Employment and productivity

Source: RUL – Financial Division

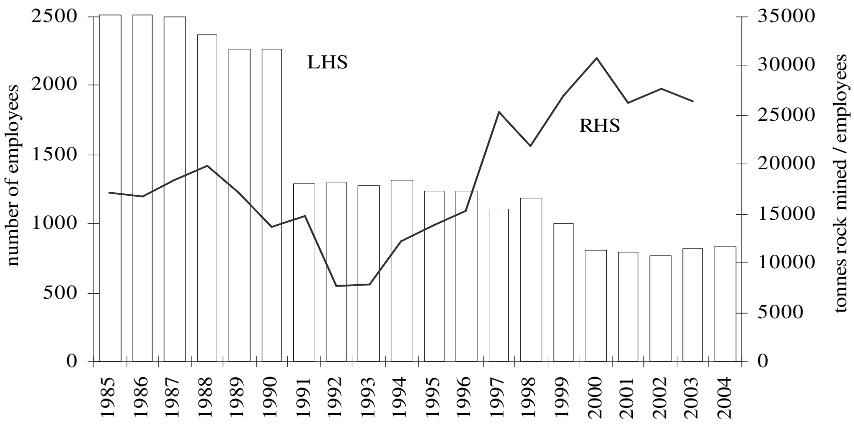
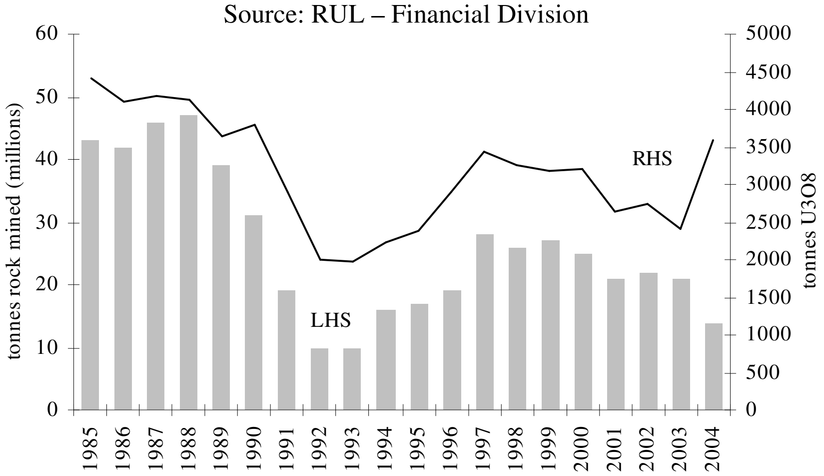


Figure 4.7 – Production volumes

Source: RUL – Financial Division



With the exception of a peak in 1991, which reflects higher labour costs due to the payment of retrenchment packages, average salaries did not improve after the first downsizing; on the contrary, they stabilised, thus interrupting a rising trend during the late 80s. The second downsizing, however, brought about a marked increment in average salaries, reflecting a more skill-based labour force, which in turn contributed to the productivity gains after 1998. None of the retrenchments followed any particular racial pattern and they have, in general, impacted all different racial groups equally.

Figure 4.8 – Average salaries by RUL

Source: RUL – Business Services

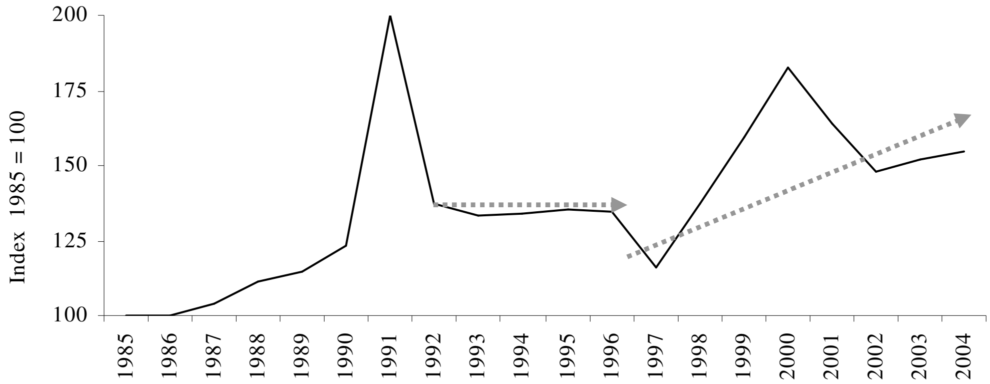
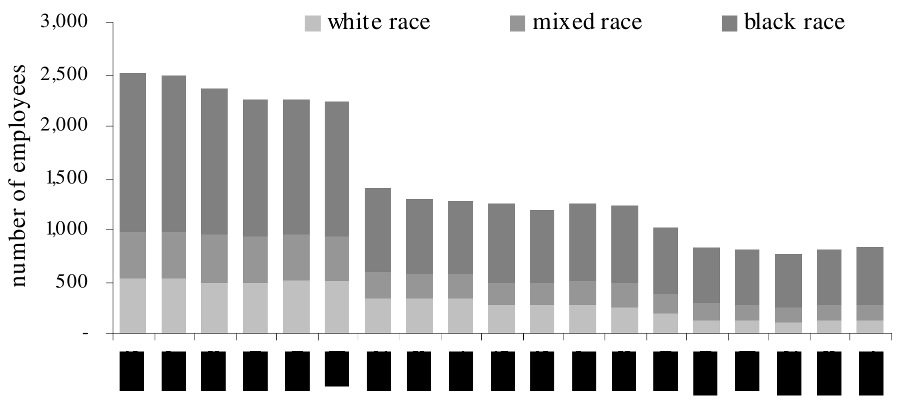


Figure 4.9 – Racial Distribution of RUL's Employees

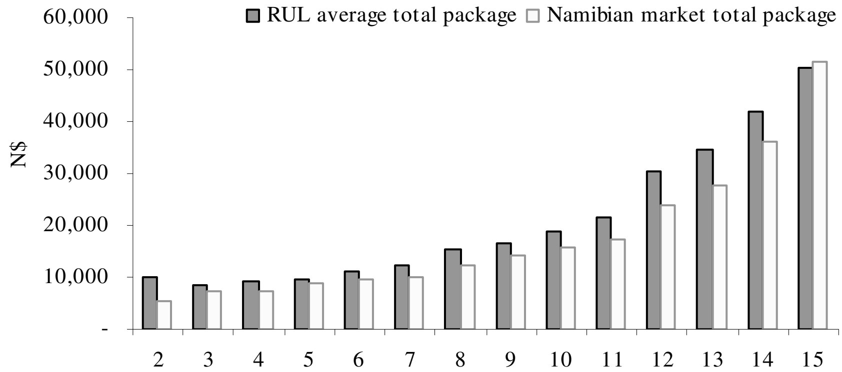
Source: RUL – Business Services



It is frequently claimed that mining salaries are higher than most other industries. In effect, Rössing pays generally better than the market average, and this is more evident when total remuneration packages are taken into consideration – i.e. basic salaries plus benefits, often including health insurance, pension, child allowances and other benefits. Figure 4.10 compares the average salaries paid by Rössing and the Namibian labour market in general (2006), organised by employment grades (ranked from 2 to 15). The difference in total payments in favour of Rössing's employees is narrower for lower grades, though it can go up to 30% for grade 11 and onwards.

Figure 4.10 – Salaries by RUL and the Namibian market, by grades

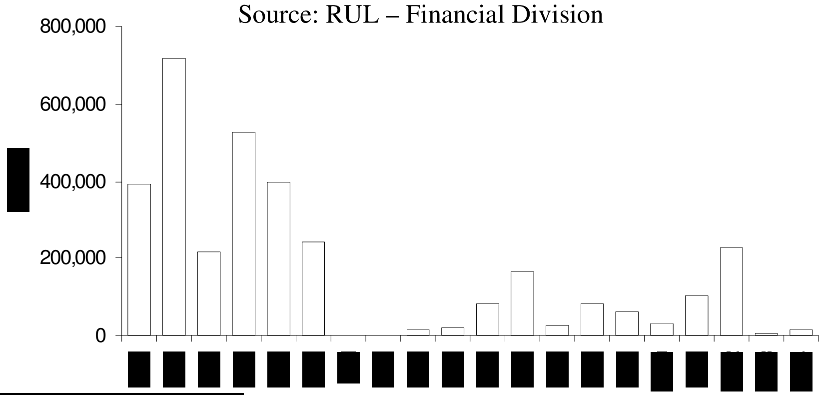
Source: RUL – Business Services



Despite national moves towards political decentralisation following independence, the bulk of taxes paid by the company bypassed the local level and went straight to the central administration at the time in which RUL started to consider early closure. The tax regime applicable to Rössing had been simplified in 2000, and is based on corporate taxes set at a fixed 37.5% of taxable profit (FIAS 2006). Tax on dividends was the other main contribution to the national administration (there were no royalties applicable until 2006[47]). Hence, as the most direct government revenues from mining were, at the time, a function of profits, the better the company's financial performance was, the higher the government's income became. However, the decade and a half leading to 2004 was not a fruitful period for this business and payments to government were often rather thin. In terms of local duties, Rössing's direct payments to the City Council in the concept of property tax as well as water and electricity charges were about N$2,5m (US$340,000) at this time.

Figure 4.11 – Tax payments by RUL

Source: RUL – Financial Division



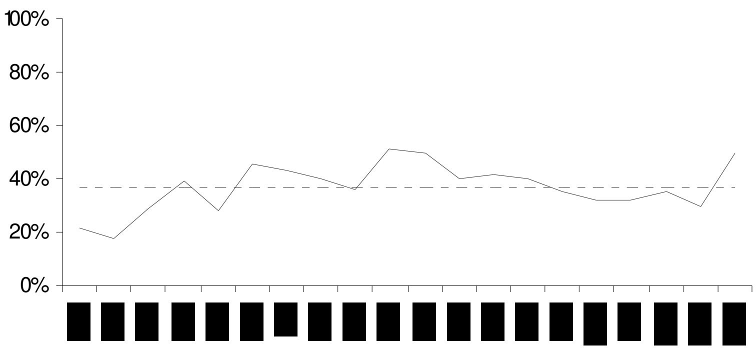
[47] Namibia introduced a 10% royalty charge for diamonds and a 5% royalty for non-diamond mining production in 2006.

4.2.1 Payments to suppliers

In the time series introduced in figure 4.12, the average participation of payments to suppliers in total sales value was 38%, which is typically much lower than that of other industries, for instance mechanicals, footwear, or in fact most manufactured products. In relative terms, high value added industries offer smaller business opportunities within their supply chains, and thus, smaller opportunities for economic diversification and the expansion of backward linkages (see chapter 2 for more on this). However, particularly considering the relative size of both Rössing and the Namibian business sector, these opportunities have been significant for the economy in absolute terms (around US$50m in 2004)[48]

Figure 4.12 – Payments to suppliers to total contributions

Source: RUL – Procurements

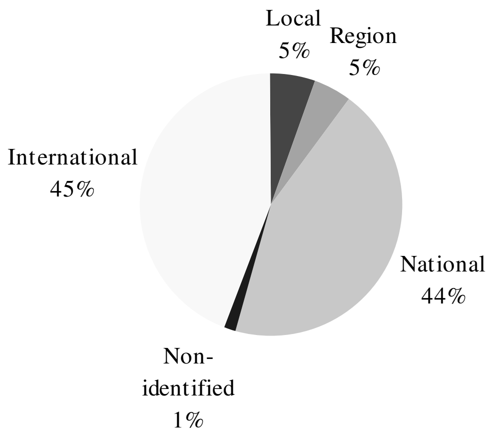


The following analysis focuses on understanding where these outsourcing opportunities concentrated, and explores the geographic origin of the final goods and services acquired by RUL. The data introduced in this study has been stripped of capital goods and thus reflects operating purchases only. Figure 4.13 shows the distribution of these supplies by geographic level (i.e. local, regional, national and elsewhere), according to the invoice for each transaction. While the majority of RUL's payments are made to suppliers based in Namibia, only 10% of them take place in the Erongo region – and only 5% in the vicinities of the mine.

[48] As global demand for Uranium picked up, leaving the fears of early closure behind, payments to suppliers jumped to US$91m in 2005

Figure 4.13 – Value of supplies by origin, 2004

Source: RUL – Procurement



An important question posed by the prospects of early closure has been how to guarantee economic sustainability at the local and regional level after closure, and how long it would take to achieve this. Among several alternatives analysed later in this study, one of the strategies considered attempted a quick expansion of the local supply chain that could serve other regional industries and mines once RUL has closed down. The analysis below explores the potential for substituting imports with local products and services inherent in Rössing's supply chain. Table 4.1 lists the top 30 suppliers according to invoice value in 2004. The electricity provider was the main single supplier, followed by a provider of acids, oil products, mechanical parts and repairs, water, tyres, and rail transport. The vast majority of national suppliers are based in Windhoek, the capital, and almost all regional suppliers are in Walvis Bay, a nearby port and main hub of trade. There is just one local firm among the top 30 suppliers, which is in fact a service contractor. The relative weight of these suppliers is high: the top 10 firms accounted for nearly 60% of the total purchase value during the year (also see figure 4.14)

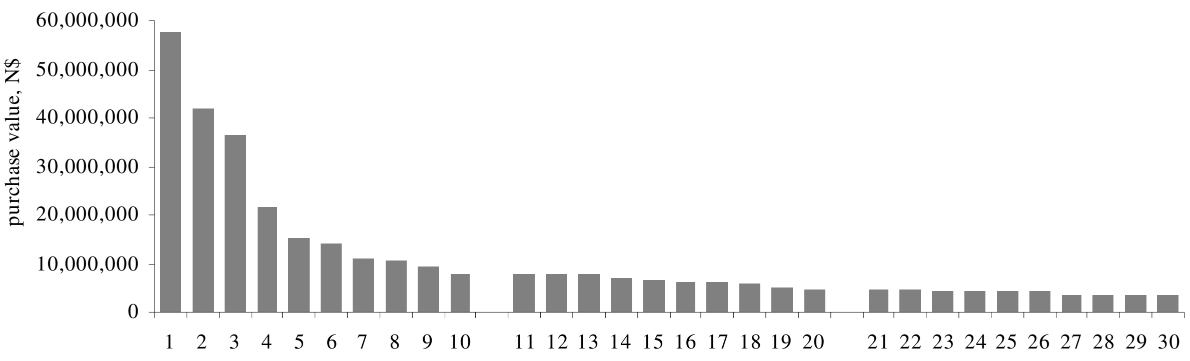
Table 4.1 - Top 30 suppliers by invoice value (%), in 2004

Source: RUL – Procurement

	Supplier	Description	Invoice value as % of total	Location
1	NAMIBIA POWER CORPORATION (PTY) LTD	Electricity	14.9%	National
2	INTERACID TRADING SA	Acid	10.8%	International
3	SHELL NAMIBIA LTD	Fuels & Lubs	9.4%	National
4	KOMATSU	stock haultruck maintenance	5.6%	International
5	NAMWATER	Water	4.0%	National
6	BRIDGESTONE/FIRESTONE SA (PTY)	Tyres	3.6%	International
7	NAMRAIL (PTY) LTD	Railtransport	2.8%	National
8	ISCOR LTD LONG PRODUCTS (NEWCASTLE)	Structural steel	2.7%	International
9	ARANDIS SERVICES	Civil contractor	2.5%	Local
10	OMNIA FERTILISERS (PTY) LTD	Explosives	2.1%	International
	Sub-total		**58.3%**	
11	SNF FLOERGER	Mineral processing technologies	2.0%	International
12	WOKER FREIGHT SERVICES (PTY) LTD	Freight Services	2.0%	Regional
13	GHANA MANGANESE COMPANY LTD	Manganese ore, process chemical	2.0%	International
14	SONNEX (PTY) LTD (NAMTRAC)	Equipment maintenance contractor	1.8%	Regional
15	FYNSORT TECHNOLOGY LIMITED	Radiometric Sorters & the repairs of sorters	1.7%	International
16	PYLON ENGINEERING	Mechanical Spares	1.6%	International
17	SASOL SMX A DIVISION OF SASOL CHEMI	Explosives	1.6%	International
18	NEC STAHL	Contractor	1.5%	National
19	MAGOTTEAUX (PTY) LTD	Scaw Metals	1.3%	International
20	ERONGO CONTRACT SERVICES CC	Labour hire	1.3%	Regional
	Sub-total		**16.8%**	
21	WESBANK TRANSPORT (PTY) LTD	Road transport	1.2%	Regional
22	ROTARY HYDRAULIC & PNEUMATIC MINING	Drill and shovel spares	1.2%	International
23	MARUBENI CORPORATION	Marketing services Japan	1.2%	International
24	KOMATSU SOUTHERN AFRICA CONSIGNMENT	Haultruck Parts	1.2%	International
25	METSO MINERALS	Machinery Refurbishment	1.1%	International
26	WARMAN (AFRICA) (PTY) LTD	Pumps	1.1%	International
27	SASOL CHEMICAL INDUSTRIES LIMITED	Chemicals & Explosives	0.9%	International
28	BUSINESS SYSTEMS NAMIBIA (PTY) LTD	Computer Services	0.9%	Regional
29	SANDVIK TAMROCK SOUTH AFRICA (PTY)	Drilling Equipment	0.9%	International
30	SANDVIK TAMROCK SOUTH AFRICA (PTY)	Drilling Equipment	0.9%	International
	Sub-total		**10.5%**	

Figure 4.14 – Top 30 suppliers by invoice value, in 2004

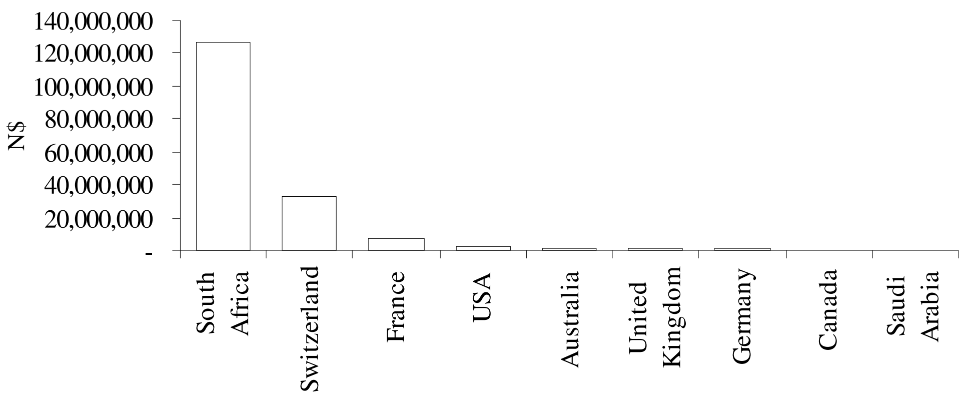
Source: RUL – Procurement



This analysis shows that goods and services equivalent to 45% of the total procurement value was imported that year. However, it is worth noting that three countries – South Africa, Switzerland, and France - accounted for as much as 97% of total imports. In fact, 74% of all imported goods were supplied by the well developed mining cluster in South Africa, and so most benefits from Rössing's supply chain remained within the Southern African region. Looking forward, expanding local linkages from the mine's supply chain would require a meticulous understanding of the company's requirements for goods and services, as well as bottom-up work with local partners and other economic players. For instance, as part of the closure studies, the company has been analysing the feasibility of the construction of an acid plant by Rössing and other local partners in Walvis Bay. If this project were to be implemented, the level of national purchases, as opposed to imports, would jump from 55 to nearly 70% (simulation based on 2001 values).

Figure 4.15 – Imported purchases by origin

Source: RUL – Procurements

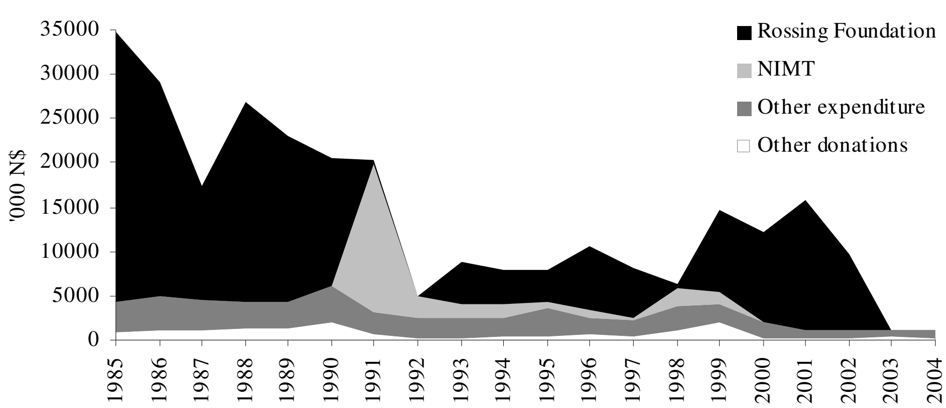


Finally, as mentioned earlier, social expenditure by Rössing has been mainly decentralised in the Rössing Foundation (RF). Annual company payments to the Foundation are equivalent to 3% of net profits. While the RF relied heavily on the company during its early days, it has managed to diversify its income base over time and 50% of its resources are currently coming from sources others than RUL, including UN agencies and direct transfers by donor countries (the Rössing Foundation website). As an independent non-for-profit organisation, the RF has in the past worked extensively at all geographical levels in Namibia, which gained it an outstanding reputation nationwide, chiefly for its work in education and capacity building. In the 1990s, RUL's contributions to the RF shrank sharply together with the company's profits, thus raising pressure from other donors, which in turn resulted in a considerable reduction of community programs in the vicinities of the mine. The commencement of closure considerations has since redirected the work of the Foundation back to the local level.

Figure 4.16 introduces a time series of total expenditure in social development by Rössing. The notable volatility in total expenditure is mainly determined by the oscillation of the company's contributions to the RF. The collapse in total expenditure at the beginning of the 1990's, and then again early in the new millennium, did not reflect a deliberate reduction in social engagement, but rather the severe decline of company profits. Although the RF has always been the main recipient of RUL's social investment, the company's contributions to communities have also taken other forms. As transfers to the Foundation declined, the early 1990s witnessed a peak in expenditure for the construction of the Namibian Institute of Mineral Technology (NIMT) in Arandis, which was donated jointly with the South African government for independence, and contributions to cover maintenance costs continued until 1999. NIMT has since become a very prestigious institution for mining research and the training of skilled professionals with influence on the whole of Southern Africa. 'Other expenditures' includes community services, tuitions, aid for training and educational assistance, books and sport competitions. 'Other donations' includes minor direct donations such as those to local schools.

Figure 4.16 – Expenditure in social development (N$ of 2001)

Source: RUL – Financial Division



In short, although overall contributions to the economy have declined substantially since inception, they continued to be of great importance. These contributions have taken different forms and affected the local and national economies differently: (i) in a still highly centralised governmental administration, most tax payments circumvent the local and regional level on their way to Windhoek; (ii) although employment has fallen dramatically in the last fifteen years, relatively large labour payments injected into the economy continue to contribute to the local economy significantly; (iii) payments for supplies and services have been imported into the Erongo region in their great majority, although most of overseas goods come from neighbouring South African; (iv) direct social expenditure has been extremely important locally, and the long-lasting legacy of organisations such as the Rössing Foundation and NIMT cannot be overestimated. The next section explores how the local economy has dealt with these stimuli – and how prepared it would have been to face up to the challenges of early closure.

4.3. The local economy: Swakopmund and Arandis

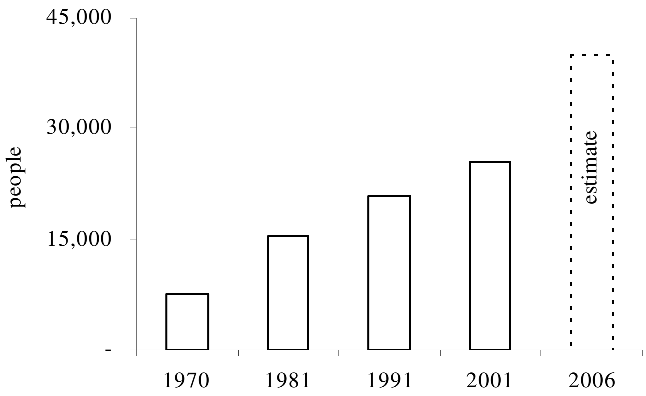
Production in the region is mainly concentrated in the fishing industry[49], mining and tourism, although manufacturing is growing rapidly. In this arid land, agriculture and cattle farming are reserved for self-subsistence. As a general feature, two serious restrictions for further development in the region are shortages of water and the scarcity, and hence high price, of housing (SPC 2007). That is certainly the case in Swakopmund, a charming coastal town approximately 65km from the mine and 380km west of Windhoek. Swakopmund relies largely on primary resources and tourism for its economic base. It became well established as a holiday destination in the 1940's, and its architecture still conserves many European features typical of its colonial past. A high demand for plots and holiday homes developed after the completion of the national road connecting Windhoek and Walvis Bay, in 1967. Another large expansion took place in the 1970's after the Rössing mine's inception[50]. Although Swakopmund's greatest potential arguably lies in tourism, it has also become a support point in the road-and-rail commercial transport corridor

[49] Fishing is mainly concentrated in Walvis Bay. The potential for further expansion in this sector is limited by the natural fishery stock, already overexploited.
[50] RUL began operating in 1976, reaching full production in 1978

Windhoek / Walvis Bay. Walvis Bays is the second largest town in the Erongo region after Swakopmund, 30km south, and is Namibia's principal harbour and the transport destination of Rössing's produce.

Figure 4.17 – Population in Swakopmund

Source: Central Bureau of Statistics and the Municipality of Swakopmund

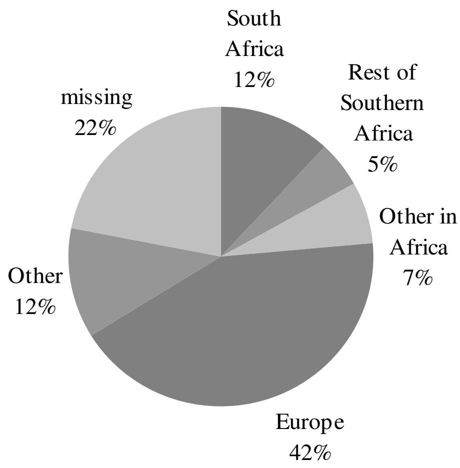


Population growth in Swakopmund was heavily influenced by RUL. During the 1970's the population doubled, from 7,641 in 1970 to 15,473 in 1980, fuelled by a vigorous migration into the region. The growth rate averaged an annual 9.3% during this period, much higher than that of Namibia (3.6%). The trend declined during the 80's, and in the 90's the local population grew slower than in the rest of the country (figure 4.17). According to data from the last national census available at the time of writing, the permanent population in Swakopmund was 25,442 in 2001[51], 89% of which were born in Namibia with the balance coming from either Europe (Germany for the most part) or Southern Africa (Central Bureau of Statistics 2001). The Chief Executive Officer Swakopmund Municipality (ED 2007), has recently estimated current town population at around 40,000 people (2006)

[51] The population in Swakopmund doubles during holiday seasons, mostly in December and July.

Figure 4.20 – Non-Namibian immigration in Swakopmund

Source: Municipality of Swakopmund



The national census also reveals that there were 7,560 households in Swakopmund in 2001. Housing in Swakopmund is organised in well-defined and socio-economically distinct neighbourhoods. Data from CZMP (1995) shows that 31% of the population lived in the former white areas of Kramersdorf, Vineta, and Swakopmund Proper; 13% lived in the former coloured[52] township of Tamariska, and the remaining 56% in the former black township of Mondesa. Nowadays, serviced land for development is very limited, and when made available by the Municipality, prospective buyers have to compete for it by way of auctions. The limited supply of land has had an incremental impact on the final prices of the plots and eventually on the prices of residential properties in town (SPC 2007).

Consistent local data is scattered and thus the existing figures for unemployment are controversial. According to the RF, the unemployment rate in Swakopmund was 11% in 2000. On the other hand, CZMP (1995) had estimated a perhaps more realistic 30%, still below that of the Erongo Region and Namibia as a whole. The latest data available on employment goes back to the late 1990s. Table 4.2 shows the evolution of formal employment by sector in Swakopmund and Walvis Bay. In 1998, fishing was the main formal employer (industry principally based in Wavis Bay though). Mining[53] came in fact in a fourth place, behind commerce and tourism.

[52] Locals refer to people of mixed ethnic background as Coloured

[53] Employment in mining is mainly in RUL, but there are also small operations of salt, and granite.

Table 4.2 – Formal employment by sector, Swakopmund / Walvis Bay (jobs)

Source: Municipality of Swakopmund

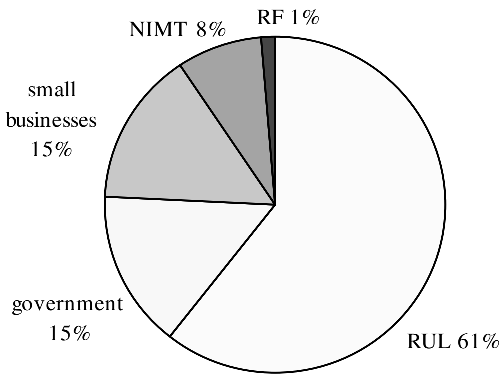
SECTOR	1994	1995	1996	1997	1998
Agriculture, commercial	12	19	23	17	12
Agriculture, subsistence	250	250	250	260	260
Aquaculture	13	13	14	13	13
Fishing	6493	7293	6134	6692	6516
Mining and quarrying	1587	1567	1517	1573	1554
Manufacturing	411	455	795	980	1208
Electicity and water	162	175	181	196	193
Construction	95	410	394	381	374
Accommodation and catering	2025	2109	2216	2127	2207
Transport	812	811	818	821	813
Communication	54	54	53	55	55
Commerce	5841	6030	5290	5705	5587
Community services	1168	1245	1327	1369	1412
Others	13	17	17	23	29
TOTAL	**18936**	**20448**	**19029**	**20212**	**20233**

The town of Arandis is located 60 km northeast of Swakopmund, and less than 5km west of the Rössing Uranium mine, in the Namibian Desert. By contrast to Swakopmund, Arandis was established and developed as a mining town in 1976, and has historically housed semi-skilled and unskilled mine employees. The population in Arandis was 7,590 people in 2001 (Central Bureau of Statistics 2001), living in 1,900 houses. Approximately 40% of residents owe their houses in town. In 1994 the town was proclaimed an independent town with an elected Local Authority. The mine handed over the management and provision of municipal services to the Arandis Town Council (ATC) (Rössing Foundation 2003).

As economic duress impacted the company, Arandis was progressively left alone in its struggle to increase reliance on its own revenues. Yet, non-mining income in town is currently very limited. For instance, around two thirds of Arandis population still depended directly on salaries from Rössing in 2004. Others worked at few small local shops, civil services and the Town Centre (Hoadley et al 2005). Independent research by NDC (2002) identified the key disadvantages of operating a business in Arandis as follows: a) distance from other markets; b) limited local market; c) distance from suppliers; d) high communication costs; e) lack of transport; f) shortage of skilled labour; g) lack of start-up capital and support, and h) lack of support from local government.

Figure 4.19 – Formal employment in Arandis

Source: Hoadley et al 2005



The unemployment rate in Arandis seems to be lower than that in Swakopmund (88% of adults are employed full time), as most retrenched people relocate to other parts of Namibia in the search for jobs. Migration into Arandis is very low: less than 7% in the four years prior to 2004 (SIAPAC et al 2004). Despite the distance, shopping habits are still connected to Swakopmund, with people travelling to the coastal town for this purpose once weekly. Moreover, largely due to housing shortages in Swakopmund, a number of people working there have chosen to commute daily from their homes in Arandis. Some local commentators have associated all of this to a serious lack of ownership, pride and commitment with the town that is evident, for instance, in the residents' unwillingness to pay municipal services, or their inability to engage in any sort of community activity (NDC 2002, NEDICO 2002)

4.3.1 A long tale of economic impact assessments

In 1991, during the first downsizing process at RUL, the Swakopmund City Council hired an independent consultancy firm, Deloitte Pim Goldby, to carry out an economic impact assessment of possible further changes in the mine's input factors, which up to that point had hit Swakopmund and Arandis equally – e.g. 50% of retrenched employees from each place (Deloitte Pim Goldgy 1991). The objective of the analysis was to quantify the loss in income flowing to local businesses due to the company's downsizing, and in doing so it considered three different scenarios. The study assumed that (a) 80% of disposable income from employees remained in the local economy[54], and that (b) its final impact on the economy would be affected by a multiplier factor of 1.2[55].

Table 4.3 – RUL's retrenchments and three local scenarios

Source: Deloitte Pim Goldby 1991

	scenario 1 - optimistic	scenario 2 - most likely	scenario 3 - pessimistic
Production level (tonnes)	3,750	2,500	1,250
Number of employees at RUL (fte)	1,700	1,390	700
Loss in disposable income from RUL (N$/year)	5,328,000	10,833,600	23,088,000
Total income loss inc. multiplier effect (N$/year)	6,393,600	13,000,320	27,105,600

As part of this research, this study revisited the forecasts put forward by Deloitte Pim Goldby back in 1991. At the time at which RUL started to consider closure, further downsizing had determined employment figures at a level equal to the pessimistic scenario depicted by the consultant ten years earlier[56]. The economic impact on Swakopmund, however, seems to have not been as catastrophic as initially predicted, as for one reason or another, during this time the local economy had started to diversify and specialise in activities other than mining.

Figure 4.20 shows the evolution of employment in selected industries (refer to Table 4.2 for the whole list). Although the data available misses out the impact of the big RUL retrenchment of 1991 and later in 1999/00, some interesting trends still arise from these records. Overall, employment in mining was quite stable over the period, and small movements in RUL's employment explain small oscillations. After 1998, mining employment in the region had declined at the pace of the second big Rössing retrenchment. Accommodation and catering increased slowly, though clearly outperforming mining as job provider, and ratifying the great potential for tourism in

[54] It is worth noting the analysis ignored the effect of retirement packages of dismissed employees as well as pensions spent locally

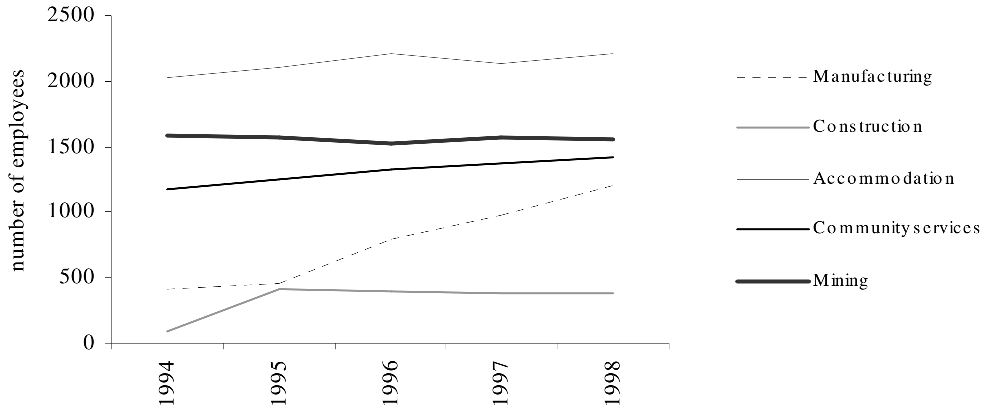
[55] Multipliers are measures of the impact on the aggregate economy per unit increase in the sector. For instance, income multipliers estimate the increase in economic activity resulting directly and indirectly from an increase in the sector's activity. Its size is determined by the proportion of capital injected in the economy that is re-utilised within the region.

[56] RUL had 798 direct employees in 2001. Note, however, that steady increases in labour productivity pushed production levels up (2,640 tonnes in 2001), relative to the consultant's predictions (1,250 tonnes). The consultant underestimated the effects of productivity on total output.

Swakopmund. Accordingly, construction peaked in 1995 and remained stable throughout the period, more connected to an increasing demand for holiday dwellings than to houses for the mining sector. Most interestingly, manufacturing was the fastest growing sector, jumping from 455 jobs in 1995 to 1,208 in 1998, in a strong upward trend.

Figure 4.20 – Formal employment in selected sectors, Swakopmund / Walvis Bay

Source: Municipality of Swakopmund

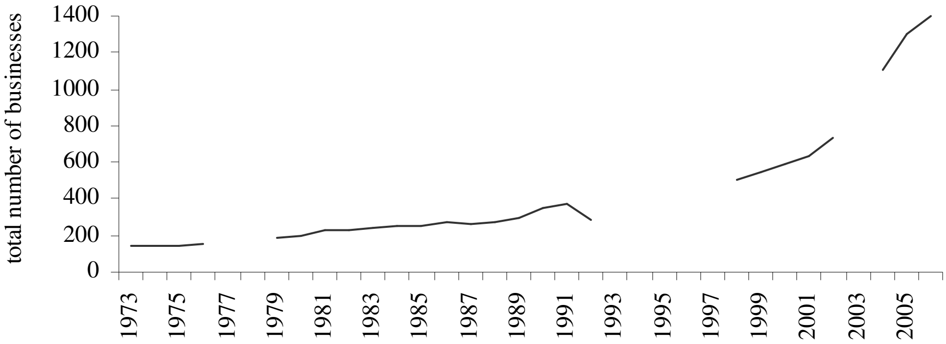


Data on local registration of businesses has been more fruitful. The evolution of the local business sector is suggested here as a proxy to total economic activity. Businesses registered in Swakopmund climbed from a stable 140 units at the beginning of the 1970s (prior to RUL's inception), to 194 and 368 in 1980 and 1991 respectively. Following the first major downsizing at RUL, local businesses collapsed in 1992. There is a gap in the data until 1998. Interestingly, registered businesses jumped that year to 504 units, and kept on rising to 729 in 2002 (Archives of the Municipality of Swakopmund 2004).

This trend can accommodate different explanations. First, the de-regulation process that started after independence may have impacted positively in business creation. Second, de-regulation may have facilitated the registration of activities already existing in the informal economy. Third, increasing diversification may explain the emergence of small and mid-size enterprises, especially in tourism. There is little evidence that retrenched employees may have used their relatively large retrenchment packages to start new businesses. While many of them had tried to remain in Swakopmund after dismissal, Mosimane (2003) claims that very few had in fact invested in formal entrepreneurial activities successfully. Note, finally, that the second downsizing process that started in 1998 does not show negatively in the chart. Similarly, current records show that there were 1,400 business registered in Swakopmund in 2006.

Figure 4.21 – Net business creation in Swakopmund

Source: Archives of the Municipality of Swakopmund

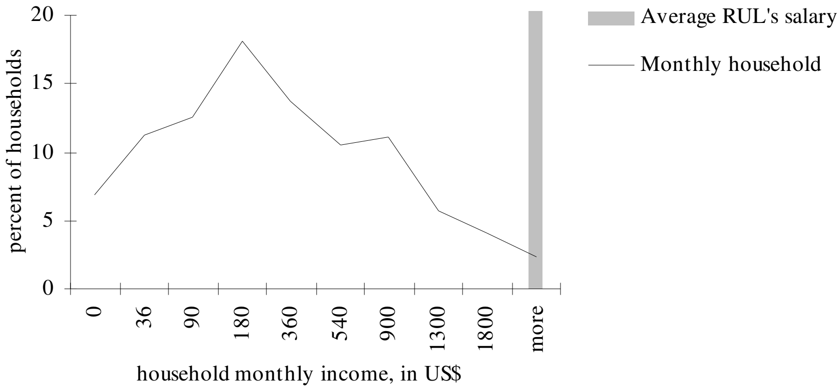


The Erongo Region has the highest income per head in the country after the Khomas Region (where the capital Windhoek is situated), although as in the case of Namibia as a whole, unequal wealth distribution and social exclusion continue to be notorious (Ekstrom 1998). Recent data on local income distribution is non-existent. According to the Research Facilitation Service (1998), however, while less than 3% of households[57] in Swakopmund earned more than US$1,800/month, 50% got less than US$180/month at the end of the millennium. Figure 4.22 shows income distribution in Swakopmund and average salaries paid by RUL in 1998. This marked disparity has been linked to a local inflationary process led by the real state market in Swakopmund, which started with RUL's inception and that is currently deepening, accentuating a process of gentrification long present in the town (SPC 2007). With a shrinking mining sector and Rössing planning for closure, however, this phenomenon presently seems more closely associated to a characteristic of holiday destinations than that of mining towns.

[57] Average household consists of 4.2 members. Families are social constructs that can be more inclusive than immediate family (on average, each household house an average of 0,5 other family member)

Figure 4.22 – Income distribution in Swakopmund and RUL

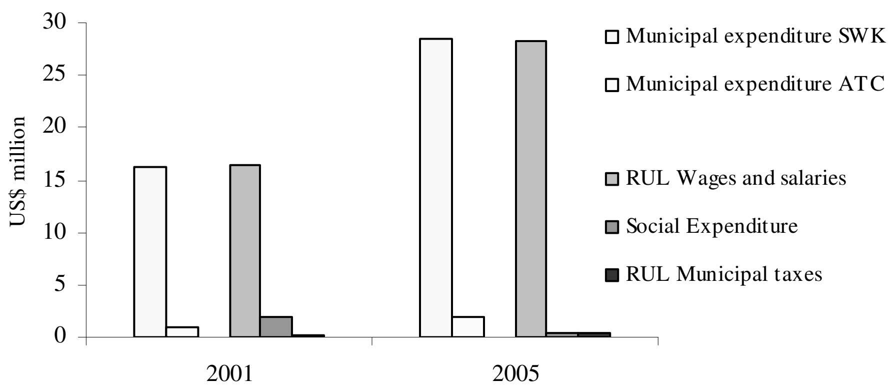
Source: Municipality of Swakopmund and RUL



Nevertheless, mining salaries reinvested locally have constituted a remarkable stimulus for the local economy. Figure 4.23 compares salaries paid by Rössing at the local level (Swakopmund and Arandis), total contributions to the community and local charges and services (excluding utility payments), with total expenditure by Arandis and Swakopmund City Council. In 2005, for example, as RUL started to respond to the increasing global demand for Uranium, payments for wages and salaries reached US$28.1m, while direct payments to the municipalities for services and other charges were around US$400,000 (excluding payments to utility companies). In the same year, total municipal expenditure in Swakopmund was US$28.6m (Municipality of Swakopmund 2006).

*Figure 4.23 – Municipal expenditure and local contributions from RUL**

Source: Municipality of Swakopmund and RUL



* excludes payments to utility companies

Although some payments remained in cash, most wages in Rössing were paid into bank accounts in 2004. In a national context of marked shortages of investment in the productive sector, the financial situation at the local level has fundamental implications for business development. In Arandis in particular, banking services are limited to twice a week, although as it occurs with shopping more broadly, residents tend to commute to Swakopmund for this purpose (Hoadley et al 2005). The banking sector in Swakopmund is well established, and there are several local/offshore banks in town[58]. However, loans are highly restricted to a small clientele and conditions are harsh (NEPRU 1999). For example, the Commercial Bank of Namibia[59] requires a minimum of 40% own capital before assisting, with annual interest rates around 20-22%. Loans and credits for business start-ups, SMEs, or micro businesses are rare. In the Erongo Region, the informal financial sector has bridged this gap at outrageous prices - i.e. approx 30% interest rate per month in the streets of Swakopmund[60] (Ikhide and Fitchat 2002). As a result, a series of worrying trends take place within Rössing's workforce, worsened by the financial illiteracy of many employees. Numerous Rössing workers currently have serious financial problems. Despite having relatively good earnings, around 80% of employees live under financial stress, mainly resulting from financial mismanagement[61], child care payments for unplanned children, and financial support for an increasing number of dependent family members, due to the effects of the HIV epidemic (RS 2007).

Finally, a centralised effort toward local economic development in Namibia has been the establishment of Export Processing Zones (EPZ) after independence, which is a fiscal scheme for the establishment of export-oriented manufacturing enterprises. The main incentive set up by the regime is the drastic reduction of corporate taxes. Arandis holds an EPZ status. In addition to the fiscal cost implicit in the policy, these types of regimes bear the risk of becoming instruments for territorial competition, as opposed to strategies for industrial restructuring, and of replacing legitimate

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[58] Bank of Windhoek, First National Bank of Namibia, Commercial Bank of Namibia, Standard Bank, Bank of Swakopmund

[59] Interviews held at the Swakopmund branch in March 2007

[60] A normal modality for informal lenders in Swakopmund is to hold the client's bankcard and pin number as guarantee, and to extract the instalments directly when salaries are deposited monthly.

[61] Although Rössing employees have access to loans and credits in the local financial market, most fall behind in their payments, or indeed, cannot pay loans back at all. Under financial pressure, many in desperation turn to 'loan sharks'.

investment by one that is profitable only under special tax incentives. So far, the initiative to attract manufacturing activity to Arandis has not been successful. Locals have blamed this to the fact that Walvis Bay has obtained an EPZ status as well, thus redirecting opportunities to the costal city. In fact, EPZs as a development tool have been severely questioned in the whole of Namibia, and it is broadly accepted that they have been, as such, largely unsuccessful (FIAS 2006)

4.4. The economic impact of early closure

How badly would have early closure impacted the local economy? The analysis in this section estimates the potential economic contribution from Rössing in the different business scenarios contemplated at the time – i.e. early closure in 2008 (scenario 1) or expansion until 2016 or 2022 (scenarios 2 and 3). The present value[62] [63] (2004) of the total economic contribution from RUL was estimated at around US$408m, US$705m and US$808m for the scenarios 1, 2 and 3 respectively. On the offsetting expenditure side, US$241m, US$373m and US$434m was to be paid to suppliers in each scenario. The remaining US$167m, US$332m and US$374m represents gross value added.

[62] To make the figures for different scenarios comparable the exercise uses present value (NPV) estimates, with a discount rate of 10%. Normally, when expenditures are made over time, the values are discounted to bring them to 'present value'. Discounting accounts for the fact that there is always risk associated with income and expenditure streams over time and quite simply, it is always better to have money earlier than later. Thus, money that is to be received in the future should be valued at lower rate than money that is to be received earlier.

[63] The calculations introduced in this section are based on estimates used for project evaluation and thus follow the same assumptions in terms of production volumes and uranium price, which already reflected increases in the price of uranium – and thus made expansion seem a more plausible option.

Table 4.4 – Estimate of total economic contributions from Rössing, by scenario [(a)]

Source: RT Technical Services. Local/national and saving ratios from Deloitte Pim Goldby (1991)

	Scenario 1 (2003 – 2008)		Scenario 2 (2003 – 2016)		Scenario 3 (2003 – 2022)	
	N$m	US$m	N$m	US$m	N$m	US$m
Wages, salaries and benefits	720	97	1197	161	1385	186
Taxes and royalties	45	6	164	22	201	27
Interest payments	-15	-2	-7	-1	0	0
Earnings (b)	492	66	1118	150	1199	161
Total value added	1242	167	2471	332	2786	374
Payments for supplies	1686	241	2781	373	3234	434

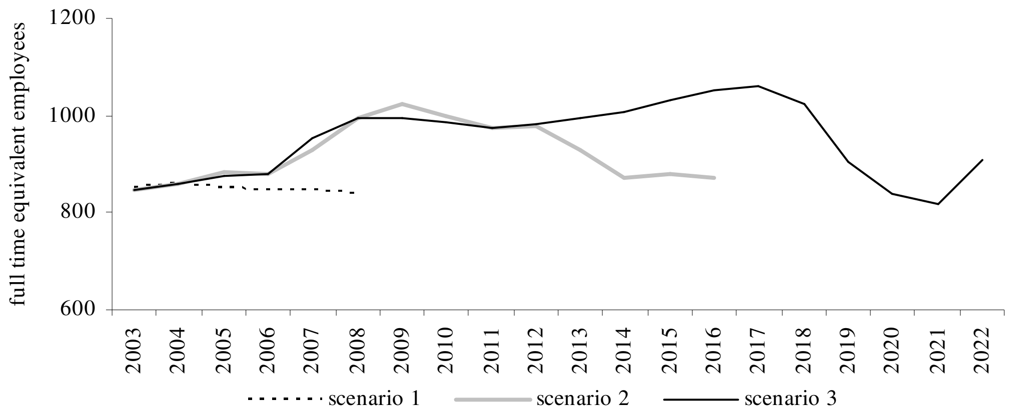
(a) Exchange rate as per Dec 2003 US$1 = $N7.4

(b) Includes dividends and retained earnings

Source: Calculations based on estimates used for project evaluation, Rio Tinto Technical Services.

Figure 4.24 – Direct employment opportunities by scenario

Source: Based on estimates for project evaluation, Rio Tinto Technical Services



With regards to employment, average job opportunities in scenarios 1, 2 and 3 were estimated at 848, 926 and 954 people p/year, respectively. Scenario 1 estimated closure within 6 years, while projections for scenarios 2 and 3 reflect a mine's life span of 14 and 19 years. As discussed earlier, labour compensation was at the time the biggest form of value added locally. The present value of these payments was calculated at US$97m in scenario 1, US$161m in scenario 2, and US$186m in scenario 3. How much of this money would actually flow into the local economy, or, more precisely, how much would stop flowing once the operation ceases activities?

The table below estimates this by combining the figures introduced above with some indexes capturing key local economic features discussed earlier[64] [65]. The overall contribution to local income from Rössing's labour payments exclusively would have been US$65m, US$108m or US$125m in cases 1, 2 and 3 respectively.

Table 4.5 – The importance of Rössing's labour payments to the local economy [(a)]

Source: RT Technical Services. Local/national and saving ratios from Deloitte Pim Goldby (1991)

		Scenario 1 2003/08		Scenario 2 2003/16		Scenario 3 2003/22	
# of employees (average p/year)			848		926		954
		N$m	US$m	N$m	US$m	N$m	US$m
Labour remuneration (b)		720	97	1,197	161	1,385	186
Disposable income (c)	0.7	504	68	838	113	970	130
Local/national ratio (d)	0.8	403	54	670	90	776	104
Total local income (estimate of multiplier)	1.2	484	65	804	108	931	125
Total estimated income p/year		80	11	57	8	49	7

(a) Exchange rate as per Dec 2003 US$1 = $N7.4
(b) Present value estimate (discounted at 10%)
(c) Total income after personal taxation and savings
(d) Ratio of consumption taking place locally. Includes transfers to family members in other parts of Namibia

4.4.1 The economic sustainability of Arandis

Closure would have had strong consequences for the Namibian economy in general, but of all the challenges it would have brought, the most critical was (and still is) the economic sustainability of Arandis. Rössing was directly responsible for its construction as a mining town, and although it is currently run by an independent administration, it still today relies heavily on the company, and is therefore still largely associated with it. Failure to secure the town's economic independence could therefore have strong consequences for Rio Tinto's reputation. The analysis introduced in the previous section showed that early closure would have stopped

[64] As referenced earlier, in 1991, during the first downsizing process at RUL, the Swakopmund City Council commissioned an economic impact assessment of eventual further changes in the mine's input factors.
[65] The average tax-taking rate used is 30%.

significant monetary flows into the local economy and, perhaps more importantly, it would have also denied vital time to consolidate a better transition toward new sources of jobs and income for Arandis. The closure deliberations by RUL considered three main scenarios for the town (ML 2004): (a) directing resources towards local economic diversification and business generation in activities other than mining; (b) aiming at transforming the current economy into one with high degree of specialisation, most likely in the education sector; or (c) relocating existing activities and population to Swakopmund.

a) Economic diversification and business generation

This approach considered that economic diversification in anticipation of closure is achievable, and that this is needed to compensate for the income that will be lost when RUL is decommissioned. This scenario is also based on the assumption that a change in trend in the currently declining population, and the recovery of the deteriorating but significant infrastructure in place, could be rapidly accomplished (the Rössing Foundation 2001). This infrastructure consists of water supply, power, asphalted roads, three schools and a health clinic, NIMT, and housing, all of which are scarce and very valuable resources in Namibia. Business generation and expansion in Arandis would prove difficult to sustain, however. Rössing's salaries still generate most of the demand for goods and services that keep the town alive. Arandis' economy seems to lack the comparative advantages needed for the attraction of investment necessary for business development – particularly so in competition with the nearby Swakopmund and Walvis Bay and their growing manufacturing sector.

b) Specialisation (centre of educational excellence)

The second option under consideration was economic specialisation – in particular as an education centre. This alternative rests on certain competitive advantage provided by existent infrastructure (NIMT and several schools). Specialisation can bring in new and different sources of income (i.e. fees, private contributions, subsidies etc). This is an innovative approach, which would require a large amount of upfront planning and strong commitment from management. The conversion of Arandis into an education centre will also demand extra capital investment. The company's influence within the central administration could be essential for maximising opportunities and redirecting government support, as well as that from international organisations and other not-for-profit institutions, for grants, scholarship schemes and so on (ML 2007). This alternative would require time for a well planned transition to work, and Swakopmund would likely have a key role to play during the process. Nonetheless, this shift would imply a change in the characteristics of the local population, from mostly low and semi-skilled miners to one based on students, teachers, professors, and some related supporting sectors. This still poses the question of what prospect exist for those currently living in Arandis, a majority of which are Rössing's employees.

c) Dismantle and relocate to Swakopmund

Although Swakopmund is certainly better prepared to absorb population and economic activities that seem increasingly unsustainable in the mine's vicinity after closure, the large build up of infrastructure makes this a very undesirable option. Also, the government was in principle firmly opposed to any plan to dismantle Arandis. Yet, existent infrastructure has to be maintained and thus it could quickly become a liability to locals. Despite the best intentions, business generation and broad economic diversification will be extremely challenging. A large portion of the income in town leaks out of the circular flow – mostly through consumption, which takes place largely in Swakopmund, and through relatively prominent savings sent away to family members in other parts of the country. Marginal propensity to invest in Arandis has been typically non-existent (Hoadley et al 2005). Without alternative sources of income, people would likely relocate for jobs to other parts of the country, as has happened after large retrenchment processes in the company took place in the past.

Regardless of these observations, the possibility of abandoning Arandis to its fate soon started to be seen as simply too high a risk for Rio Tinto (ML 2007). Rössing has since reaffirmed its explicit dedication to Arandis' sustainability, and categorically rejected the possibility of dismantling the town. The company persuaded the RF to refocus its activities to Arandis (the RF opened an office in town in 2003) and to take charge for an Arandis Sustainability Project, ASP. Within this context, the Foundation then assumed responsibility for a number of programs including SME support; tourism promotion; education; recreation and culture, health and safety, and local government infrastructure. Consisting of the RF, the ATC and RUL, an Arandis Steering Committee was then set up and charged with the task of setting the investment priorities as well as reviewing the Foundation's programs in Arandis. Within this context, the ASP defined the vision for Arandis as follows (Arandis Sustainability Project 2004 p1):

> *'Arandis is an independent and viable town that is known as a centre of excellence (in everything we do). A model town that is a platform for vital economic activity, places its citizens first, and is the town of choice to live in'*

RUL also established a Closure Fund for Arandis. In addition to the company's financial commitment to the RF, this fund was to receive regular financial contributions that would be released at closure. The specific objective of the Fund was to constitute a pool of money large enough as to top up shortfalls in the Council's operating budget for at least five years after closure, thus contributing to an orderly transition. The ATC depends primarily on rates and water and sewage charges for its revenue; however, the municipality had struggled to generate sufficient revenue to cover its operational expenditure since it gained autonomy, let alone setting funds aside for capital projects (Arandis Town Council 2006). There are a number of reasons for this, including the fact that the water accounts make a loss consistently (for several reasons, including the high level of water loss in the system), poor payment records of both employed and unemployed residents, as well as poor payment by government departments (e.g. in 2004 the Ministry of Education had long standing debts with the ATC). The Council has been systematically cutting back on the efficiency of the services it provides (Hoadley et al 2005)

4.5. Further reflections on Arandis

This study has highlighted the economic impact of RUL at different geographic levels. In the context of a national economy that is still well based on the exploitation of natural resources, the cessation of Rössing's activities would have always had a significant impact. During closure deliberations, the issue of economic diversification and business generation in activities that could be sustained after the mine's closure has thus made it to the top of the agenda. To some extent, the Erongo Region enjoys some comparative advantages that position it in a relatively good place with respect to other parts of Namibia. At the local level, however, the economy shows two different faces. On the one hand, although Swakopmund had suffered the cyclicality typical of the mining industry in the past, it has managed to slowly diversify its economic base. There is no evidence that the latest downsizing at Rössing, early in the new millennium, has hit the town severely (either Swakopmund or Walvis Bay for that matter). In short, Swakopmund appears strong enough to face periods of distress or economic turbulence (i.e. closure) safely.

On the other hand, Arandis, born as a mining town nearly 30 years ago, has continued to be highly dependent on the ever-shrinking demand for low and semi skilled employment from the mine. It is thus not surprising that RUL has identified the economic afterlife of Arandis as the key closure challenge for the company and put the sustainability of the town at the centre of its closure strategy. To have any chance of survival, the town's income base would have to start diversifying without delay. For example, in a drastic demonstration of the company's commitment to this strategy, (and in spite of the obvious cost implications of the measure), Rössing has recently confirmed that the plans for housing new employees following the latest expansion decision will now exclude Arandis (ML 2007). This commitment also meant that the RF had to shift the focus of attention from national programs back to the level of Arandis. Funded largely by the company, a new plan for promoting sustainable development in town was also put in place, closely monitored by the Foundation, the ATC and the company itself.

More recently, the news of the mine escaping closure and embarking instead in an ambitious expansion plan had secured more time to work on the transition: the new target for an economically sustainable Arandis is now 2016 (ASP 2004). However, considering all these initiatives; the intense attention received over the last years; and the rather sophisticated infrastructure in town, it is pertinent to start asking why

Arandis has not yet shown signs of revival – and, looking forward, whether it could ever become sustainable.

Some of the key stakeholders involved have pointed out to what they see as problems with the type of intervention promoted by the Rössing Foundation thus far. Marie Hoadley (MH 2007), for instance, believes that the Foundation's focus on training needs to be revisited: *'Training programs put in place by RF in the past (e.g. agriculture self subsistence etc) have systematically failed'*. Similarly, Florida Cloete (FC 2007), Chief Executive Officer of Arandis, said that '*capacity building has to come to an end. Training is a good thing, but endless training is extremely frustrating for the people'*. A similar message came up from the principals of the three schools in Arandis (SP 2007): '*The RF aims at creating an educational centre of excellence. That is far from happening. Teachers' salaries are paid by the government, but there are no central resources for capital expenditure. The RF's programs should include photocopies and printers, as well as after-hour classes and mentoring. That has not been delivered yet'*. Nonetheless, they went on to say that *'on a positive note, schools results in 2006 improved 30% with respect to previous years, mainly due to the Foundation's work training teachers*'.

There appear to be deeper rooted difficulties, however. MH has also mentioned that *'Within Arandis, RUL is overwhelmingly seen as the leading development agent – and this is very concerning. If the population think of RUL as a financial sponsor, economic sustainability will be impossible to achieve'*. In the same vein, FC stressed that once RUL announced that they will expand as opposed to closing down the operation *'[…] people became complacent again: they believe Rössing will take care. […] In fact, even the central government's position tends to be that Arandis is Rössing's problem and that they will sort it out. Despite the challenges, there are no new government funds made available to Arandis'*. The chairman of the Arandis Business Association (ABA 2007) has also added that: *'The Community is demoralised and abusing alcohol because there are no jobs and because there is no appropriation [sic]. RUL and the RF feed the problem when they put money to finance the Council's salaries and to cover for services unpaid by residents. The Foundation has grandiose plans but we cannot see the results'*

Whether Arandis has the potential to accomplish the goal defined by Rössing and others is questionable. Many believe that the definition of this goal is deeply misleading, because the conditions are not set for Arandis becoming sustainable any time soon. For example, Enviro-Business Consultancy (2004) claimed that '*the flight of physical forms of capital from this community, coupled with the lack of social and cultural capital, results in the local economy being unsustainable and dysfunctional, and that any expectation of significant economic growth […] would be unrealistic*' (p3). Pressure is mounting on different fronts: considering the financial circumstances in which the ATC currently finds itself, there is a real and imminent risk that Arandis will be relegated to a village status, which would represent a mortal blow to any hope left for ever attaining local sustainability. As opposed to towns, villages are managed by central government administrators, in what in practice represents a severe *de facto* downgrading in the provision of town services (FC 2007)

To recapitulate, it is unquestionable that Rössing has taken closure very seriously and that it has shown commitment to identify and tackle the challenges emerging from this. Chief of these challenges has always been the future of Arandis. With most stakeholders openly relying on the company to come up with the solution to this problem – but at the same time signalling that anything other than securing the town's longevity would be unacceptable -, incentives for debating dispassionately seem to have been missing. Within this context, and with a central government that has made no solid vow to the town, the company has adopted what was arguably its only plausible option: to declare its full determination to attain economic sustainability. However, while the town will always be associated to the mine, it is now an independent entity and its economic fate has effectively grown beyond the company's hands. It remains to be seen whether all the efforts and resources that are (and will continue to be) invested in backing up this strategy would have not been better spent on an orderly transition towards a vision of the Erongo region without Arandis.

4.6. Final remarks

Sustainable development has deeply changed the expectations that both the local and international communities have on companies' behaviour generally and, as particularly explored in this case study, their long lasting legacy. For the mining industry, closure may be seen as the ultimate SD challenge: if these business activities were going to convert a latent underground wealth into other, more sustainable forms of wealth, then closure should be the right occasion to finally assess this. Closure provides an opportunity for an *ex post* evaluation of the economic implications of mining. In this sense, these implications might be more relevant to large multinational corporations with a reputation at stake, such as Rio Tinto, than for single-mine companies that would otherwise cease to exist after decommissioning. The economic fate of Arandis posses a very real threat to Rio Tinto's future license to operate in Namibia and other parts of the world.

The discussion in this paper has made the case for addressing these questions early on; the key economic challenges caused by the prospects of decommissioning Rössing had been, in fact, inherited from decisions made decades ago, many of which can be tracked down to the mine's early days. Similarly, decommissioning cannot be treated as an isolated challenge but instead as an integral part of project design; as such, a closure strategy should be entrenched in every aspect of the mining plan, and should thus pay close attention to, for instance, mining and processing activities, human resources, employee accommodation, transport and further infrastructure, as much as it does to C&E (communities and environment). This discussion, however, has also reinforced the idea that these questions cannot be single-handedly addressed by mining companies. Closing down a large mine is typically an extremely stressful event for host economies, and thus policy decisions in this respect should include a large number of local – and in cases national – stakeholders.

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Chapter 5

The expansion challenges of Pilbara Iron – and the local ambitions for economic sustainability

5.1. The Meaning of Economic Sustainability in the Pilbara

The beginning of the worldwide mineral boom early this decade has resulted in a rapid shift in the strategies of large mining companies, from cost cutting to output maximisation, as an attempt to cash in the unprecedented price bonanza. In many cases, the quickest way for companies to increase production has been to invest in expanding existing operations, otherwise known as brown-field investment. This type of investment brings in very specific challenges, as pre-existing economies have to accommodate a rapid increase in the demand for inputs such as labour or infrastructure, with quite significant implications in terms of sustainable development (SD). Chapter three introduced Rio Tinto's subsidiary Pilbara Iron[66] (PI) and the Australian region in which its mining operations take place, the Pilbara, in Western Australia (WA). PI, the largest contributor to Rio Tinto's revenues since 2004, committed to a significant expansion of its operations, equivalent to a combined investment of more than US$4.5 billion. It has always been clear that an investment of this magnitude would create substantial challenges as well as opportunities for both the mining house and the regional economy (Mining Journal, various issues 2004, 2005, 2006)

The scale of this expansion is such that most groups of people in the Pilbara will be affected. For PI there would be arguably two stakeholders with unrivalled importance: the State and local government, and the Aboriginal people. The government has long articulated its vision for the Pilbara[67] as that of '[…] Sustainable and independent communities, underpinned by a strong and diversified economy' (Pilbara Development Commission 2005, 2006, DLGRD 2006). State negotiations with the company have been guided by this vision and targeted increasing local benefits from the operations. For instance, Pilbara-based accommodation has always been the government's preferred housing option for mineworkers, at a time in which FIFO[68] was strongly opposed (CMEWA 2005). In the same way, the town normalisation – a process by which the State government started to regain

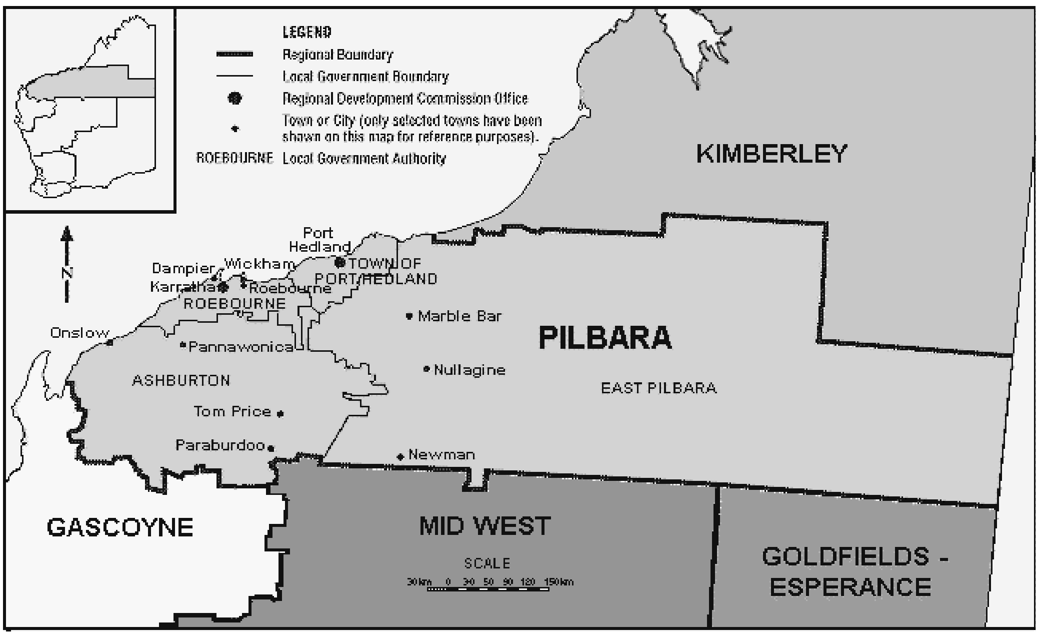
[66] PI operations encompass a network of ten mines, an extensive railway line, three ports and the power supply system, in addition to several mining towns.
[67] See, for instance, The Pilbara Development Commission, www.pdc.wa.gov.au
[68] Fly-in and fly-out.

responsibility for company towns in the Pilbara - gained momentum during the last decade based on the assumption that these towns could, in effect, became 'normal' and sustainable towns.

In the second group, many Aboriginal people in Australia still inhabit the most remote and isolated parts of the country. In this sense, Rio Tinto's Community Standards highlight the company's commitment to establishing special relationships with these communities through permanent consultations (Rio Tinto 2000), and recognises the Aboriginal people as the traditional owners of the land now within Rio Tinto's mining concession. Furthermore, the company has repeatedly stressed its promise to always obtaining their prior consent before new mining begins. This consent has frequently been formalised in carefully negotiated and legally binding agreements, which can include recognition of no-go areas and targets for Aboriginal employment, as well as specific economic contributions by the company, which has often included direct transfers to ad hoc Aboriginal Trusts and Funds. Regardless of these efforts, the Aboriginal participation in the formal economy remains extremely low. For one reason or another, these communities have not benefited from the booming mineral economy.

Figure 5.1 - Map of Pilbara region and towns

Source: URS (2005)



PI has ratified its commitment to SD in going forward with the current expansion (for instance, Pilbara Iron 2005c). It has also aligned itself with the government's vision for a diversified and strong regional (Pilbara) economy (Minera 2004, Pilbara Iron 2005c), and has thus been inclined to position itself as a Pilbara player principally – as opposed to a broader, albeit perhaps less critical, contributor to the State economy. Reasons for this choice are manifold. As the SD agenda consolidated worldwide, attention shifted to the vicinities of the mine (MMSD 2002. See also chapter 2). Almost by definition, Aboriginal relations involve Pilbara-based activities. Also, full employment in a FIFO basis was never seriously considered a feasible option in the past, for both logistic and political reasons (CMEWA 2005). The expansion plans by PI require government approvals and compliance with existing regulations, from technical matters related to the extraction and processing of the mineral, to the expansion of essential infrastructure (e.g. railway and ports), access to land, build up of new accommodation for employees and other substantial town investment. Backing the government's idea of strong and sustainable towns became the obvious strategy for PI.

This choice would guide the corporate positioning with regards to SD in WA, including its community investment, procurement practices, targets for local and Aboriginal employment as well as the company's communication plan. However, are the government vision for the region, regulations and other agreements in accordance with the principles of sustainable economic development? Can the Pilbara ever became economically and socially sustainable? Paying the bills for unrealistic expectations (e.g. maintaining unreasonable levels of welfare in this remote location) could became a severely value-substracting policy strategy, costly indeed for both the government and the company. What lies beneth the plausibility of this vision is the nature and real economic potential of the Pilbara, and its inherent capacity to react to the large, though particular, economic stimuli by mining enterprises operating locally.

Table 5.1 – Key shire statistics

Source: Shires' Annual Reports 2003/04

	Roebourne	Ashburton
Size	15,000 sq km	105,647 sq km
Towns	Karratha, Wickham, Point Samson, Dampier, Roebourne	Tom Price, Paraburdoo, Pannawonica, Onslow
Population	15,974	6,888
Sealed Roads	525km	133.47km
Unsealed Roads	375km	2,478km

So far, the proposed vision of a sustainable regional economy has rested on the assumption that the expansion of the resource industry will de facto benefit this regional economy. Similarly, the transfer of existing company infrastructure assets to the local governments, as contemplated by the normalisation process underway, is expected to strengthen the towns and local communities. The present study puts these assumptions under examination, exploring, for instance, how much of the capital flowing into the region actually stick to the local economy; considering the performance of non-mining enterprises; and investigating the potential for economic diversification in the Pilbara. Thus, the subject of study in this chapter is PI and the Pilbara region, in particular the towns of Dampier, Karratha and Wickham, in the Shire of Roeburne, and Panawonica, Paraburdoo and Tom Price, in the Shire of Ashburton – referred in this study as 'PI towns' (Figure 5.1 and Table 5.1)

The research methodology was discussed in chapter 3. It is worth reiterating that most Rio Tinto data has been sourced from the Rio Tinto and PI financial departments unless otherwise specified. As in chapter 4, corporate data is mainly based on 2004 figures, although in some cases the information discussed reverts to the latest census available at the time of writing (2001). The analysis of the local economy mainly relies on secondary sources of information, largely from the Australian Bureau of Statistics (ABS), data from the Shires' Authorities, and other sources, which are explicitly referenced in all cases. In particular, I/O analysis is based on tables for the year 2001/02 commissioned by Rio Tinto. The study also incorporates the supporting views emerging from conversations with local residents, both Aboriginal and non-Aboriginal. All interviews were conducted in person during 2005. Finally, the study is organised in the following way: section 2 examines PI and its contributions to the economy. Section 3 focuses on the economy of the Pilbara and compares it to that of WA, explores the financial situation of PI towns and reviews the challenge of normalisation. Section 4 explores the socioeconomic structure of the different communities in the Pilbara. Section 5 summarises the main findings of the investigation. Section 6 covers final remarks and key conclusions.

5.2. The company's economic contribution[69]

The contribution of PI to the economy is, in absolute terms, huge. In 2004, the value added by the business was equivalent to A$1.9 billion (U$1.5b) – out of a gross turnover of A$2.9 billion (US$2.2b). In addition, the activities by the company generated demand for goods and services from other sectors in the economy equivalent to A$0.9 billion (U$0.7b). While the gross turnover of the business has grown substantially during this decade, (reflecting increases in total production, exchange rates movements[70] and, more fundamentally, significant rises in the price of iron), the overall economic composition of these activities has seldom changed, value added still accounting for over 60% of the total value of mineral production. As argued in chapters 2, modern mining tends to add more value to the economy in relation to the total value of the industry's production than most other sectors, which is largely explained by the intensity of capital required to operate – i.e. the relatively high allowances to repay to the providers of capital[71].

[69] All PI figures in this study are in accordance with the UK GAAP accounting system. Direct comparison with current corporate reports should take into consideration the fact that Rio Tinto has most recently adopted the IFRS system.
[70] In mining, contract prices are nominated in US dollars while costs are largely in local currencies.
[71] In 2004, PI paid A$718m (U$552m) to the providers of capital, 79% in dividends and 21% in interest payments. In addition, the company retained A$421m (U$324m) to allow for the replacement of depreciated assets as well as for future investment.

Table 5.2 – PI economic contribution

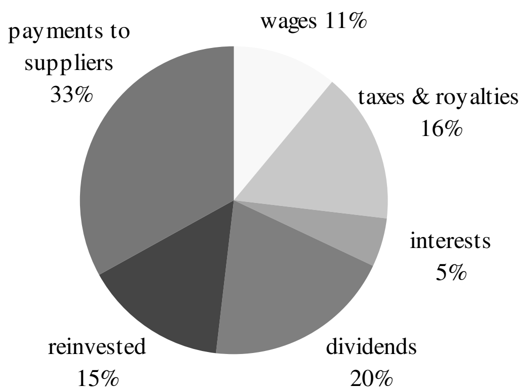
Source: Based on data from PI

U$ million	**Payments to Suppliers**	**Value Added**	**Total Contribution**
PI 2003	517 (30%)	1,186 (70%)	1,703
PI 2004	704 (33%)	1,473 (67%)	2,177
Change from 2003	36%	24%	28%

In the present analysis based on annual cash flows, this capital intensity is represented by the aggregation of interest payments, dividends and capital reinvested in the Rio Tinto Group, which roughly accounted to half of the value added by PI in 2004, or one third of its gross turnover (Figure 5.2). The category 'reinvested' entails earnings retained within Rio Tinto for future investment, earnings attributable to outside shareholders, amortisation and depreciation. While it is possible to assume that part of the capital that Rio Tinto is currently investing in PI expansion originated in the Pilbara, typically the best capital markets are not to be found in remote Australia. The most direct effects of this large component of value added are likely to go away from the local level of the operations, and thus to have a negligible effect on economic development in the vicinities of the mines.

Figure 5.2 – Economic contributions by PI in 2004

Source: Based on data from PI



The rest of the value added by PI is essentially taxes and labour payments, which combined accounted for 27% of gross turnover in 2004, similar to that of Rio Tinto as a whole (26%). That year, the total amount paid to PI employees in wages and salaries was A$316m (U$243m). This figure includes employee benefits for over A$76m (US$58m), encompassing relocation allowances, rental and interests assistance, water and power subsidies, and annual allowances, among other benefits applicable to PI employees living in the Pilbara. Total employment by the company was just above 3,500 people, the vast majority of which were Pilbara residents. PI jobs based in Perth accounted for 9% of the total. There were 11 PI employees working outside Australia in 2004 (PI 2005). Overall, there were 134 Aboriginal people working for PI in 2004, 2/3 as direct PI employees and the rest as contractors.

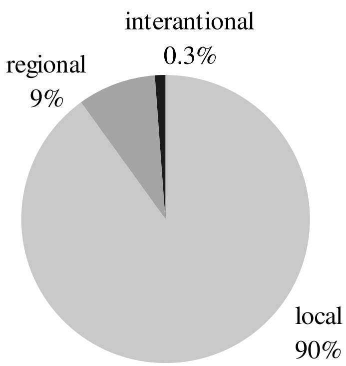
Table 5.3 – Employment by PI in 2004

Source: PI Human Resources

	Employee	Expat	Seconded	**Total**
Coast (Cape Lambert & Dampier)	1,138	4	0	**1,142**
FIFO (Brockman, Yandicoogina, West Angelas)	529	1	0	**530**
Inland (Tom Price, Marandoo, Paraburdoo, Pastoral Stations, Pannawonica)	1,532	2	0	**1,534**
International (Hong Kong, Beijing, Korea, London, Shanghai, Japan)	0	11	0	**11**
Perth	316	12	5	**333**
Total	3,515	30	5	**3,550**

Figure 5.3 – Employees by location

Source: PI Human Resources



Total employee numbers in PI surged during the 2000s, matching the tendency for the mining industry in Australia. Overall, mining employment in Australia declined steadily during the 1990s, along with (or, perhaps, explained by) strong increases in productivity in the sector (RTED 2004). There was also a consolidating trend towards outsourcing labour in the late 1990's and early 2000's, which has been in part an attempt to respond to business cycles more flexibly. However, due mainly to the mineral boom worldwide, with prices for most commodities at record highs, total employment in Australia rebounded in 2001, reaching 92,000 people in 2004. This came together with a new restructuring wave in the sector, triggering higher demand for skilled jobs, which in turn explains, at least partially, increases in average mining wages higher than the average for Australia. Demand increased for highly qualified employees, particularly engineers. A notable surge in exploration expenditure also made geologists scarce (Hall 2003, Argus Research 2004). Rio Tinto Global Practice Leader Recruitment, Errol Muir, warned that 'there is insufficient skilled staff available to the industry, [...] in Australia alone, the resource sector will require 70,000 more people by 2015' (The Mining Journal 2006 p3)

Table 5.4 – Mining employment in Australia

Source: RTED 2004

000 employees	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Coal			18	20	18	20	21	21
Oil and gas			6	4	6	4	4	6
Metal ore			31	29	30	34	35	38
Other mining (inc. services)			25	25	24	23	26	27
Total mining	86	83	80	78	77	80	86	92

While mining has typically paid well, this mineral boom exacerbated differences with other sectors. Table 5.5 compares average salaries paid by mining and other selected industries in Australia. In 2004, mining was by far the best paid occupation in Australia with each mineworker earning an average of A$1,600 per week, more than double the average for the whole economy. Later this work will turn the attention to how much these above-average labour payments are in fact contributing towards sustainable economic development in the Pilbara.

Table 5.5 – Average weekly earnings by industry in Australia (2004)

Source: ABS catalogue 630.2010

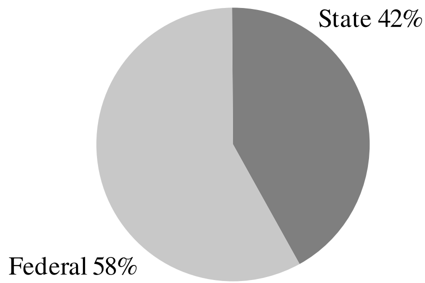
A$ per person	
Mining	1608
Electricity, Gas and Water Supply	1229
Finance and Insurance	1038
Communication Services	936
Transport and Storage	929
Manufacturing	907
Government Administration and Defence	907
Construction	849
Wholesale Trade	844
Education	779
Property and Business Services	769
Average	**746**
Health and Community Services	708
Personal and Other Services	642
Cultural and Recreational Services	631
Retail Trade	432
Accommodation, Cafes and Restaurants	390

In 2004, taxes and royalties charged to PI amounted to A$460m (U$354m), which represents 16% of total sales value. In this case, 42% of the total charge corresponds to the government of WA and the balancing 58% to the federal government (Figure 5.5). The tax and royalty charged during a year is often different from the figure actually paid by the company, as some payments are frequently deferred to the following year. PI also generates an extra income stream to governments through indirect and other taxes such as employee taxes, social security contributions and others. In 2004, PI paid A$426m (U$328m) in taxes and royalties, including direct duties like corporate taxes as well as indirect (payroll, VAT etc) and other taxes. Of that amount, PI reported A$3.9m (U$3m) paid in rates to the local administrations[72] (PI 2005b), which represents less than 1% of the total.

[72] Excludes utility subsidies and other employment contributions

Figure 5.5 – Geographic Distribution of Tax and Royalty Charges, 2004

Source: PI Tax



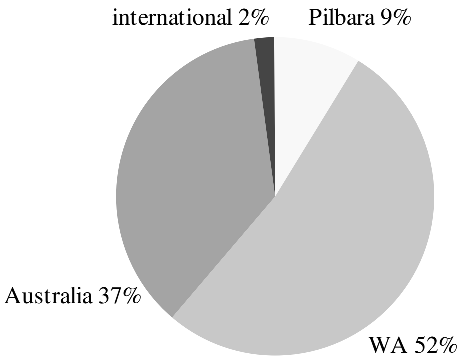
5.2.1 Payments to suppliers

In 2004, PI's demand for materials, facilities and services from other sectors of the economy was A$915m (U$704m), or approximately 33% of gross turnover. These statistics reflect PI operating supplies. In producing these numbers, PI's consolidated annual vendors' database has been stripped of most capital expenditure items reflecting purchases for the expansion program as well as other capital costs. Although in cases this separation was challenging (i.e. it has been difficult to distinguish contractors' work carried out for the expansion project from that of operating activities), the methodology should still convey an accuracy of more than 90%. Where are the benefits from this expenditure mainly felt? The following analysis looks at the level of sourcing from within a given economy – the geographic origin of the final goods and services acquired -, as the most frequently used proxy for backward linkages (UN 2001). Figure 5.6 shows the distribution of these supplies organised in four categories (local, regional, national and elsewhere) reflecting the postcodes in the invoice of every purchase[73]. Virtually all operating purchases where bought in Australia, with only 2% having been brought in from abroad. Also, more than 60% of the total was obtained within Western Australia. Less than 10%, however, appears to have been sourced from within the Pilbara itself (PI 2005b).

[73] Note, however, that practically every single item purchased would contain intermediate supplies purchased from somewhere else. For large items, it is possible to get a fairly accurate idea of the origin of the bulk of these intermediate parts – for instance, key supplies such as fuel are increasingly being purchased centrally through the Group's procurement arm, Rio Tinto Procurement, to secure maximum advantage from scale economies-, though it would be virtually impossible to track down the complete productive chain for every purchase made by PI. Later this study readdresses this issue, looking at the local content of local purchases in more detail.

Figure 5.6 – Origin of PI operating supplies, 2004

Source: Rio Tinto Procurement & PI

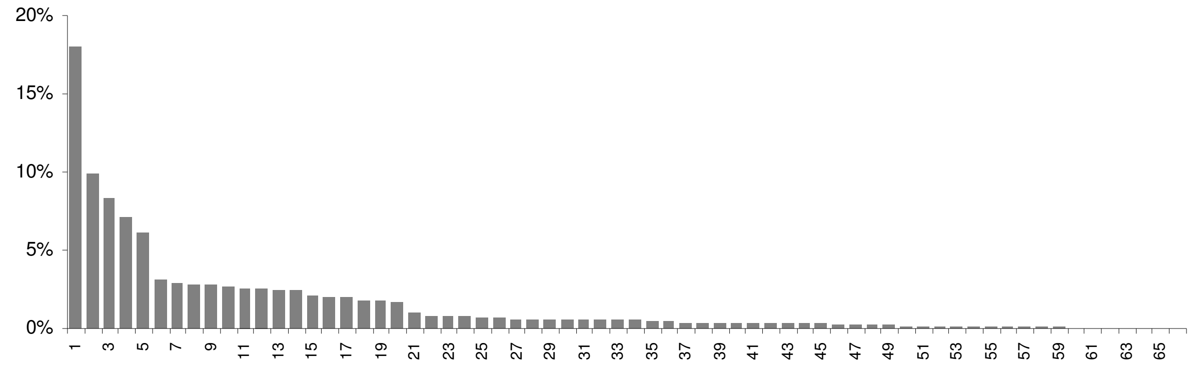


As suggested in earlier chapters, the industry's interpretation of economic sustainability has often favoured strategies for substituting imports with local products and services. This work investigated the actual scope for this happening in the Pilbara. Figure 5.7 displays the complete list of operating goods, materials and services procured by the company in 2004, this time organised by type and ranked by dollar value. Similarly to the analysis conducted on Rössing, in chapter 4, there is a huge concentration of value in relatively few items here as well. Out of more than 60 categories, the top 5 account for almost 60% of the total value, while the top 15 account for over 80%. In contrast, the lowest 30 categories account for just over 5%. By far the largest item in terms of value was fuel, accounting for 18% of the total, followed by contractors[74] (including civil, mining, drilling and marine contractors). The next group of vendors includes mechanical parts, (either for the trucks or railway operation), explosives, travel costs (including FIFO operations), electrical and industrial supplies. The other end of the graph is populated by smaller items like office supplies, car hire, clothing and uniforms, travel agency services and couriers (see Appendix 1 for details).

[74] These statistics are likely overestimating the importance of contractors slightly, as it was impossible to obtain a clean separation between capital and operating activities in this category.

Figure 5.7 – PI operating supplies by category, 2004

Source: Rio Tinto Procurement & PI



Included in the company's total contribution to the economy is PI's direct expenditure in the community. PI reported providing direct benefits to the community worth A$22m (U$16m) in 2004 (PI 2005c, Rio Tinto TS 2005). Interestingly, this represented a striking ¼ of total Rio Tinto's direct investment in the community worldwide (US$88m), which is 40% higher than its share contribution to Group turnover in 2004. Arguably, this is the area where most discretionary company investment to advance SD objectives should be expected to take place. PI claims that these contributions have financed development projects for the most part, as opposed to philanthropic donations, in accordance with the SD principle of avoiding community dependence. The company reports that half of this investment was direct community investment, encompassing a variety of programs like heritage or training, principally aimed at Aboriginal communities. Direct handouts only represented 1% of the total. It is noteworthy, however, that the overall cost of managing these programs accounted for more than ¼ of the total investment reported (Figure 5.8).

Figure 5.8 – PI community expenditure in 2004

Source: PI Community Relations

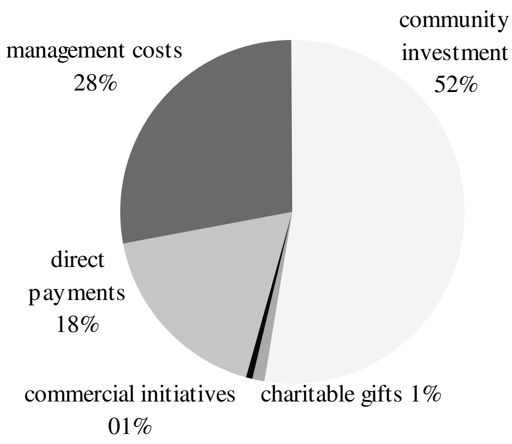


Table 5.6 below introduces a detailed breakdown of these payments. The largest individual payments correspond to (i) training programs, (ii) the Future Fund, and (iii) Native Title Payments. Excluding management costs, these items account for 85% of the total expenditure. A few observations on the way in which some of these contributions have been accounted for: While the Future Fund is an ad hoc, PI-created fund that redirects investment into selected projects for social development, thus being a voluntary initiative by the company, the Native Title Agreements are instead enforceable contracts negotiated and signed with organised traditional land owners, and thus non-voluntary contributions. Although much smaller in value, the total reported for community expenditure includes contributions to Pilbara towns. As these are largely company towns, created for the single purpose of housing mineworkers, the beneficiaries of this investment are largely PI employees. As such, these initiatives could have also been catalogued, for instance, as HR programs for employee retention.

Table 5.6 – Community investment by PI in 2004, A$

Source: PI Community Affairs

Community Investment	
Community and Towns	59,025
Heritage	1,163,962
Community Development	336,851
Training	7,100,000
Future Funds	2,610,736
External Affairs	117,000
West Angelas	95,000
Expansion Projects	11,302
Total	**11,493,876**
Charitable Gifts	
Community and Towns	100,901
Heritage	3,919
Community Development	67,248
External Affairs	19,131
Pannawonica	74,755
RRIA Exec Mgt	7,365
Pilbara Rail	8,428
Expansion Projects	4,107
Total	**285,854**
Commercial Initiatives	
External Affairs	56,753
Pannawonica	16,295
Total	**73,048**
Direct Payments	
Native Title Payments	3,949,023
Total	**3,949,023**
Management Costs	
Community and Towns	10,138
Future Funds	371,776
External Affairs	3,126,434
Negotiation	2,170,565
Community Affairs ATAL Salaries	466,493
Total	**6,145,406**
Grand total	**21,947,207**

Capital investment represents an additional flow of money into the economy, in part financed by money previously retained that is now reinvested in the business. Normally, this investment consists of acquisitions, the purchase of land or other property, equipment, and new construction or expansions. Capital expenditure by PI was A$1billion (U$0.77b) in 2004 (PI 2005b). Frequently, the local component of capital expenditure tends to be small during the operating years (often the equipment requirements are highly sophisticated and are not available locally), and higher during construction (in inputs such as labour and materials). However, given supply restriction on local labour and materials, most inputs for construction in the Pilbara are also imported from other regions. In addition, the current expansion program entails an overall investment of over US$4.5 billion, which is expected to add capacity of around 80 million tonnes per year.

In short, the magnitude of PI's economic activities is enormous, although a significant fraction of these benefits appears to be bypassing the local level on its way to Perth. Virtually none of the tax and royalty payments are made to the local administrations. Also, a level of imports into the Pilbara larger than 90% of total operating purchases suggests a fairly small multiplier effect locally. On the other hand, even when some of PI's discretionary investment in the community is in fact contractually binding, it overall represents a very material capital injection into the local economy. Similarly, payments to mineworkers is huge compared to other industries in Australia – and these have been mostly made to Pilbara residents. However, the extent to which this stimulus helped consolidate a diversified and sustainable local economy is not yet. The next section explores this question in detail as it shifts the attention to the regional and local economy.

5.3. The Pilbara economy

Table 5.7 shows that mining (including oil and gas) is by far the largest economic sector in terms of dollar value in the Pilbara. Also worth noting is the outstanding expansion of the sector in this decade, driven to a large extent by sustained demand from China, which has resulted in an unprecedented period of high commodity prices. This expansion, in fact, continued until the end of the cycle in late 2008.

Table 5.7 – Value of production by industry in the Pilbara (A$ millions)

Source: Pilbara Development Commission

A$ million	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Agriculture	24	28	27	39	na	53	na
Mining	9,130	8,370	11,717	15,762	14,865	15,892	14,543
Fishing	14	15	18	12	13	17	19
Manufacturing	134	na	na	na	134	na	na
Construction	78	35	30	40	42	59	85
Retail	355	na	na	na	298	na	326
Tourism	na	na	107	118	147	112	na

Mining includes minerals and petroleum

The Pilbara contributes 55% of the minerals and energy production in WA (Department of Industry and Resources 2006). Of a total value of mineral production of A$14.5 billion (US$11.3b) in 2004, oil and gas and iron ore accounted for 62% and 34% respectively, the balance corresponding to salt, copper, sand and other minerals. In 2004 the Pilbara produced more than A$9 billion (US$7b) of energy products, including crude oil, LNG, LPG-butane, LPG-propane, and natural gas. The region also produces 95% of all the production of iron ore in WA – and more than 90% of that in Australia. In 2004, the Pilbara produced 196 million tonnes of iron worth A$5.3 billion (US$4.1b). The bulk of this production is exported, principally to China and Japan, but also to South Korea, Taiwan and Europe. There were two large producers in the Pilbara in 2004: PI, which produced circa two thirds of the total iron ore in the region, and BHP Billiton Iron Ore (BHPB), accountable for the rest[75].

Figure 5.9 – Iron ore production in Australia and Western Australia

Source: Department of Industry and Resources of WA

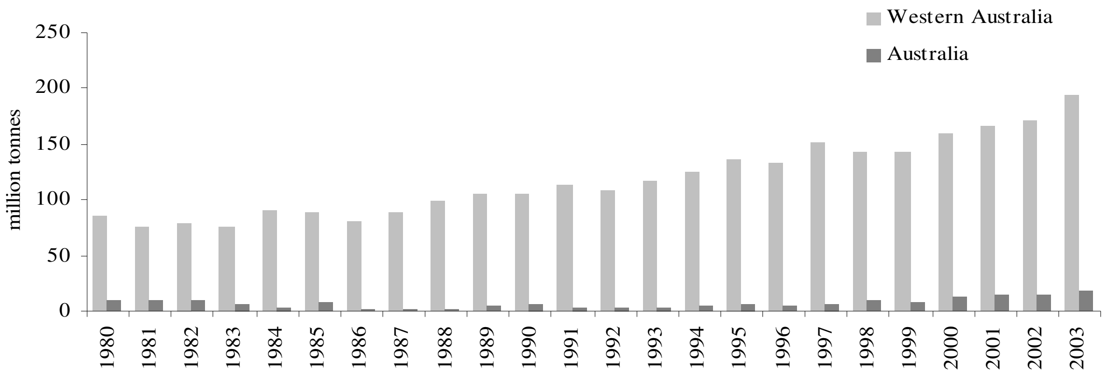


Table 5.8 shows the dramatic increase in royalties from mineral production in the Pilbara that was paid to the government of Western Australian as the expansion of the mining sector started to gain momentum. Iron ore was by far the largest contributor with A$284m (US$222m) in 2004. The Pilbara is generally considered the most prospective and under-explored mineral cluster in Australia, which has prompted analysts to assert there is good potential for sustained resource development, and with it, good prospects for long term contributions to the State's coffer (Dames and Moore 2000).

[75] In 2009, these two companies rocked the markets with the announcement that they intended to form a 50/50 strategic alliance to operate their Pilbara resources jointly. At the time of writing, this alliance was still subjected to regulatory approvals.

Table 5.8 – Mining royalties from operations in the Pilbara

Source: Department of Industry and Resources of WA

000 A$	1995/96	2000/01	2003/04
iron ore	178,437	265,313	283,853
solar salt	1,166	1,335	1,491
manganese	1,091	2,842	3,164
Chromite	n/a	295	1,117
Copper cathods	864	1,601	1,641
total	181,558	271,386	291,266

The local manufacturing industry is tiny compared to mining. The main form of manufacturing in the Pilbara falls under the category 'metal products, machinery and equipment'. The latest statistics available correspond to 2001, and estimated a value of production of A$134 million (US$105m) in the Pilbara. However, this statistic largely entailed the BHP Hot Briquetted Iron plant, which ceased operations later in 2004. Smaller activities also exist, including the prawn processing industry at Nickol Bay near Karratha. There were some prospects for the installation of a downstream petroleum industry for fertilisers and chemical production at the time of writing.

The pastoral industry still plays an important role locally. It is the major land user in the Pilbara and provides employment of local people including many Aborigines. In 2004 the value of agriculture production was estimated to be A$53 million (US$41m), 1.2% of the total agriculture production in WA. The cattle industry is the primary activity. During the same year, the fishery production in the Pilbara was A$19 million, or US$15m (there are three major commercial fisheries in the region). Pearl production is another small local industry. Pearls are grown on land-based aquaculture sites. No financial data has been obtained[76]. Finally, 260,000 tourists visited the Pilbara in 2004, with an overall spent estimated at A$112 million.

In its effort to promote sustainable economic activity in the Pilbara region, the government makes available a fairly large number of financial assistance initiatives for the support of small enterprises. There are Business Enterprise Centres located in Port Hedland and Karratha, and a Chambers of Commerce has been established in

[76] Overall pearl production in WA was A$150 million in 2004

Port Hedland, Karratha and Newman. Regardless of these continued efforts towards regional economic development, total number of small and medium private enterprises is declining. According to the ABS, there were around 2,000 small to medium private enterprises in the Pilbara in 2001, two thirds of which were sole traders (Table 5.9). The Australian definition of SME encompasses businesses whose total income is between A$10,000 and A$5 million in the financial year. The Pilbara Development Commission estimates that there were circa 1,100 of such businesses in 2004. The fact that mining in the Pilbara expanded its value of production by 74% in 5 years (Pilbara Development Commission 2006) does not seem to have fuelled other economic sectors – with the exception of construction, which has been directly linked to mining in the Pilbara.

Table 5.9 – Small business information in the Pilbara region

Source: ABS, Regional Small Business Statistics, Cat. 5675.0

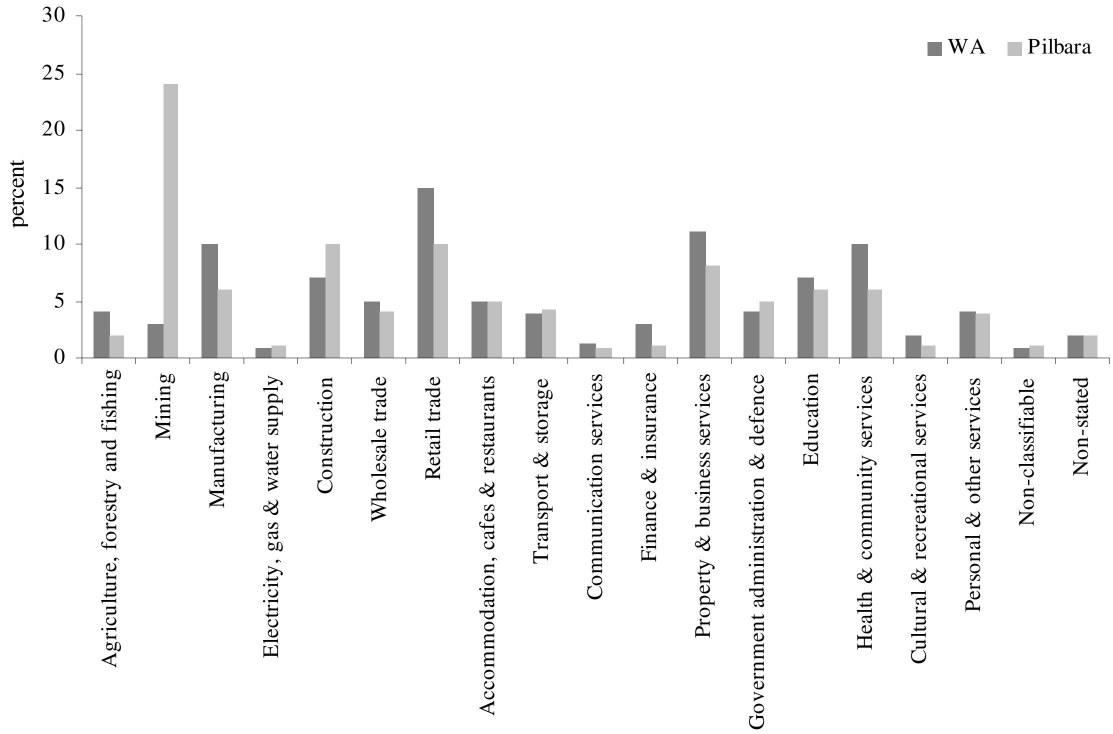
	Number of businesses	Average income	Average expenses	Average profit
	no.	A$	A$	A$
1995-96	2,651	190,749	164,195	26,554
1996-97	3,009	180,618	159,636	20,982
1997-98	3,204	176,554	157,457	19,097
1998-99	2,930	192,476	170,707	21,769
1999-00	2,711	204,570	178,774	25,796
2000-01	2,058	269,238	243,389	25,850

Whilst mining has always been the dominant employer in the Pilbara, contributing nearly 25% of total jobs, the total number of mining employees has fallen over time. Overall unemployment, however, has always remained way below WA's rates, which suggests that unemployed people do not remain in the Pilbara (RTED 2004). Unemployment in the Pilbara fell to 3.2% in 2004 compared to 5.1% in the State. As a result of the mining boom, mining employment in WA (and, in fact, employment in general) started to rise again in 2001. Accordingly, the level of payroll tax from this activity accelerated since 2002. Payroll tax paid to the WA government from labour in the Pilbara was A$40m (US$31m) in 2004 (ABS Catalogue 6202.0)

The single major employer of resident workers is Pilbara Iron. Other major employers in the Pilbara are the construction sector, retail trade, education[77], and iron ores (other than Pilbara Iron), all closely linked to the extractive industries in the Pilbara. Figure 5.10 shows employment by industry in the Pilbara compared to WA, as percentage of total jobs. While the main employers in the Pilbara tend to be industry oriented (i.e. mining and construction), they lean instead towards the service activities in the State economy, with jobs concentrating in retail trade, and property and business services.

Figure 5.10 – Employment by economic sector in the Pilbara and WA

Source: ABS Catalogue 2003.0



5.3.1 The interface between mining and the rest of the economy

This section explores the relationship between mining and the rest of the economy in the Pilbara, relying on input/output (I/O) analysis. Input-output tables provide a summary of the transactions occurring within an economy. They are used here to understand the relative importance of different industries, as well as the interactions

[77] Includes training activities outsourced by PI as part of the company's community relations

among different economic sectors. They show, for a given industry, which other industries it purchases from and to which other industries it sells to. The national input-output tables also show the use of industry production in private and government consumption, and the use in public and private investment and exports. While the ABS produces I/O tables for Australia, they do not produce state or regional tables. The most recently published national I/O table was for the financial year 1998-99. In 2004, Rio Tinto commissioned the production of I/O tables for Western Australia and the Pilbara, based on the existing national tables, and updated to the fiscal year 2001/02, in accordance to the latest available census (Acil Tasman 2005). These tables include (i) Rio Tinto's iron ore operations (PI) as a separate industry, (ii) other Rio Tinto businesses operating in the Pilbara (i.e. Dampier Salt), and (iii) 83 Pilbara-based industries, including the two Rio Tinto industries (see Appendix 2 for details). The conclusions in this section are based on these tables.

Table 5.10 presents the components of gross product at market prices (i.e. including indirect taxes) and in percentage terms for the Pilbara and Western Australia, as derived from the regional input-output tables. The Pilbara input-output tables suggest the Gross Regional Product[78] (GRP) of the Pilbara was approximately A$12,921 million (US$10,080m), or over 16% of the Western Australian economy. Remarkably, mining has a 90% share of the Pilbara economy, while no other industry

[78] An alternative estimate of the Pilbara GRP is available from the Department of Local Government and Regional Development (DLGRD 2006). This estimate is for the 2002-03 financial year and is an estimate at factor cost, as opposed to market prices, and therefore does not include indirect taxes. According to this the Pilbara's GRP in 2002-03 is estimated to be A$3,713 million. For comparison, the 2001-02 Pilbara GRP also at factor cost (derived from the region's input-output table) is A$12,470 million. There is clearly a major discrepancy between the two estimates.
The DLGRD estimate is derived using ABS data on broad industry contributions to Gross State Product (GSP) at factor cost in Western Australia. The Pilbara share of each broad industry is estimated using employment shares derived from the 2001 census (ABS). According to the 2001 census, mining employment in the Pilbara was slightly over 18% that of WA. In 2001-02, however, the output from the minerals industry (slightly different from mining in that it includes some mineral processing) in the Pilbara was 57% that of Western Australia (Department of Industry and Resources). Yet, as very little minerals processing occurs in the Pilbara compared with the rest of the state this will underestimate the Pilbara mining share.
In 2001-02, mining contributed A$14,768 million of total factor income to the economy of WA. Using the Pilbara's employment share this would translate to a A$2,722 million contribution to the Pilbara economy in 2001-02 (and A$2,733 in 2002-03, the base year used in the Department of Local Government and Regional Development calculation). Alternatively, applying the 57 per cent share derived from minerals production gives an estimate of A$8,355 million. From the Pilbara input-output table, mining's contribution to the Pilbara economy at factor cost was A$9,189 million in 2001-02. Given that the Pilbara's minerals industry production share underestimates the region's mining share, the Pilbara input-output table's estimate of mining industry contribution to the regional product appears reasonable.

exceeds 1.5%. The industry is by far the major component of the regional economy. Mining is also the largest contributor to the economy of WA, although its 19% contribution looks relatively small when compared with the situation in the Pilbara. As opposed to the Pilbara, only one out of the 18 sectors shown in the table contributes less than 1.5% to the size of the state economy.

Table 5.10 - Components of gross product at market prices, Pilbara and WA, 2001-02

Source: Acil Tasman (2005) Pilbara and Western Australian Input-Output tables, 2001-02

	Pilbara		WA	
Sector	(A$ million)	(%)	(A$ million)	(%)
Agriculture, forestry & fishing	40	0.3	3,835	4.9
Mining	11,659	90.2	15,100	19
Manufacturing	91	0.7	6,288	8
Electricity, gas & water supply	49	0.4	1,767	2.2
Construction	127	1	4,366	5.5
Trade	131	1	7,359	9.3
Accomm., cafes & restaurants	35	0.3	1,303	1.7
Transport and storage	122	0.9	4,013	5.1
Communication services	25	0.2	1,721	2.2
Finance and insurance	18	0.1	3,513	4.5
Property and business services	114	0.9	7,016	8.9
Government adm. & defence	60	0.5	2,611	3.3
Education	63	0.5	2,970	3.8
Health and community services	51	0.4	3,882	4.9
Cultural and recreational services	10	0.1	1,078	1.4
Personal and other services	38	0.3	1,548	2
Ownership of dwellings	119	0.9	5,786	7.4
Final demand [(a)]	171	1.3	4,550	5.8
Gross Product	12,921	100	78,708	100

(a) Final Demand: consumption, government spending, investment and exports

All of this indicates that the Pilbara economy specialises in mineral production. The lack of a major contribution from any other sector also indicates that very little processing of the output of the minerals industry is occurring in the region, and that the region meets relatively few of its needs from its own production. Table 5.11 breaks down mining contribution into different sectors. Oil and gas, with 69% of the total in the Pilbara, is the major contributor. Pilbara Iron is the next largest, with 19% of the total. Rio Tinto as a whole (PI and Dampier Salt) account for just over 20%.

Table 5.11 – Mining contribution to GRP at market prices, 2001/02

Source: Acil Tasman (2005) Pilbara and Western Australian Input-Output tables, 2001-02

Sector	Pilbara (A$ million)	Pilbara (% of Mining)
Pilbara Iron	2,256	19.3
Dampier Salt	106	0.9
Oil and gas	8,016	68.8
Iron ores	1,134	9.7
Non-ferrous metal ores	85	0.7
Other mining	29	0.3
Services to mining	32	0.3
Gross Product	12,921	100

Input-output multipliers are another tool that can be used to examine mining's impact on the Pilbara economy (see Appendix 2 for details on multipliers and the full set of multiplier tables). Table 5.12 shows the simple multipliers for the Pilbara mining industry (excluding Rio Tinto) and compares these with the average in the region. The simple output multipliers indicate the impact that increases in output from the mining industry have on total output in the region (note that simple multipliers, as opposed to total multipliers, do not capture the impact of additional private consumption from increased payments to labour). For example, the iron ore simple multiplier of 1.0475 means that for every A$1 increase in output in the iron ore industry there is an extra increase in output from other industries in the Pilbara worth A$0.04754.

Table 5.12 – Mining (excl. Rio Tinto) simple multipliers in the Pilbara, 2001/02

Source: Acil Tasman (2005), Pilbara and Western Australian Input-Output tables, 2001-02

	Oil & gas	Iron ore	Non-ferrous metal ores	Other mining	Average Pilbara
Output	1.0504	1.0475	1.3855	1.0599	1.4447
Income	0.0536	0.116	0.1722	0.0987	0.3216
Value added	0.7717	0.5847	0.6158	0.5456	0.6428
Employment	0.0001	0.0007	0.0033	0.0026	0.0089

With the exception of value added, the mining industry multipliers compare poorly with the regional average – i.e. increases in output in the sector have relatively little flow-on effects on the rest of the economy. In fact, the I/O tables suggest that an increase in production in the Pilbara has larger flow-on effects in WA than in the Pilbara itself. Why are mining multipliers in the Pilbara so small? As discussed in previous chapters, mining operations use relatively few non-capital inputs. Therefore, during production, mining provides a relatively small stimulus to the local economy per dollar of output. The relatively underdeveloped manufacturing and service industries in the Pilbara restrict the benefits the region can extract from mineral production. To put it differently, it seems there is relatively little scope for diversification – the economy is largely dependant on the direct contributions from mining. However, mining operations in the Pilbara are of such an enormous scale that, although their per-unit stimulus may be small, their impact on an absolute basis is still enormous.

With regards to Rio Tinto, Pilbara Iron represents a significant part of the Pilbara economy. Table 5.13 shows that PI contributes 17% of GRP. Also, earlier this study indicated that payments to local suppliers by PI were approximately A$80m in 2004. For this calculation, PI provided data on purchases by vendor for its Pilbara operations, so vendors with a Pilbara postcode were assumed to be Pilbara based suppliers. However, not all purchases from businesses with a Pilbara postcode are produced in the Pilbara, and some can be simply on-sold by a Pilbara based business. Acil Tasman (2005) adjusted these cost data so that intermediate inputs were excluded. This analysis suggests that the company consumed just over A$50 million worth of production from other Pilbara industries in 2001/02. With regards to employment, in 2001 PI employed 2,051 Pilbara residents out of a total resident employment of 16,264 people, constituting 13% of the workforce resident in the region (ABS 2001).

Table 5.13 – PI impact on the Pilbara economy

Source: Acil Tasman (2005), Pilbara and Western Australian Input-Output tables, 2001-02

Category	Impact
Share of Pilbara GRP	17%
Share of Pilbara resident employment	13%
Purchases of Pilbara production	A$53 million

Table 5.14 shows the indirect impact of PI operations through the simple multiplier effects. Comparing these figures with those in table 5.12 suggests that the output, income and employment multipliers are, in fact, quite typical for the overall mining industry in the Pilbara. The PI value added multiplier, however, is larger than most of the other businesses within the mining sector, suggesting that an extra unit of production by PI adds more value to the region than does an extra unit by the rest of the mining industry.

Table 5.14 –PI's simple multipliers

Source: Acil Tasman (2005), Pilbara and Western Australian Input-Output tables, 2001-02

Multipliers type	Pilbara Iron
Output	1.0265
Income	0.081
Value added	0.8031
Employment	0.0011

5.3.2 Making sense of town finances

This section turns the attention from the economic structure of the Pilbara as a whole, to the individual Shires and Towns. There are four Local Government Areas (LGA) in the Pilbara region: the Shire of Ashburton, the Shire of East Pilbara, the Shire of Roebourne and the Town of Port Hedland. The LGAs raise income from rates, and increasingly more importantly from a range of discretionary grants from State and Federal governments and other sources. Maintaining services in the remote and climatically extreme north west of WA is expensive, and most of these towns have a level of facilities that would have been difficult to establish without company support. Table 5.15 shows the date and basis of establishment and population of Pilbara towns (see also figure 5.1). The six main towns within the sphere of influence of Pilbara Iron (1 to 6 in the table) fall within the jurisdiction of the Roebourne and Ashburton Shires, and have varying levels of company investment and support.

Table 5.15 – Towns in the Pilbara

Source: Piper (2005)

Town	Population (% of Region)	Shire	Est. Year	Base for Establishment
1. Dampier	1,490 (3.5)	Roebourne	1965	HI & Robe
2. Karratha	10,800 (25.5)	Roebourne	1968	Pastoral – later invest by HI, Robe & Woodside
3. Wickham	2,500 (5.9)	Roebourne	1972	HI & Robe
4. Pannawonica	700 (1.7)	Ashburton	1971	HI & Robe
5. Paraburdoo	1,200 (2.8)	Ashburton	1971	HI & Robe
6. Tom Price	3,600 (8.5)	Ashburton	1966	HI & Robe
7. Port Hedland	6,000 (14.2)	Port Hedland	1870s	Pastoral, mining & pearling – later BHP
8. Pt Samson	500 (1.2)	Roebourne	1866	Pastoral and mining industries
9. Roebourne	980 (2.3)	Roebourne	1866	Pastoral and mining industries
10. South Hedland	10,053 (23.8)	Port Hedland	1973	Due to shortage of land above cyclonic storm surge

Table 5.16 summarises Roebourne and Ashburton's revenue and expenditure accounts for 2002/03 and 2003/04. The non-Aboriginal population in the Pilbara, on whose properties rates are mainly based, has been decreasing in the last years, while the local Aboriginal population has remained static – although the aggregate numbers are held up by immigration and inter-race marriages. The contribution that Indigenous people make to rates is immaterial in absolute terms, as the largest majority of the population are not homeowners or live outside the town rating boundaries (Taylor and Scambary 2005). The Shire of Roebourne receives approximately twice the revenue of the Shire of Ashburton largely from much higher rates and fees & charges, which is a reflection of its larger population centres compared with other non-urban LGAs in WA.

Table 5.16 – Summary of shire revenue and expenditure

Source: Ashburton and Roebourne shire annual reports (02/03 & 03/04)

	2002/2003		2003/2004	
	Roebourne	Ashburton	Roebourne	Ashburton
Revenue	$20,261,063	$10,792,371	$24,494,905	$11,958,329
Expenditure	$21,875,153	$9,568,357	$21,819,266	$11,788,397
Interest/borrowing costs	$46,409	$103,141	$87,270	$144,930
Net Profit or (Loss)	($1,660,499)	$1,120,873	$2,588,369	$25,002

Revenue as a percentage of asset value for the average Pilbara LGAs is 16.2%, compared to 14.4% for non-Pilbara non-urban LGAs (2001/02) (Pilbara Regional Council 2006). However, inelastic revenues and a declining non-Aboriginal population deteriorate the Shires' capacity to assume additional responsibilities for infrastructure. Moreover, close inspection to the sources of revenue suggests, in fact, that recurrent income will not be enough to sustain the current level of recurrent costs indefinitely. These Shires have very few recurrent revenue earners. Revenues from rates – 28 to 32% of expenditures– are half what they are in other Australian LGAs. The money that comes from rates barely covers public salaries (this situation would be worse if the 30% of vacancies at the time of the study were to be filled). As in most LGAs, rates are based on assessments of the value of properties. The rates are generally low compared to total revenue because of low population and the housing stock in the Pilbara increasing very slowly. Also, asset values in the Pilbara are different from large metropolitan areas like Perth. The Pilbara shires have argued that an inability to rate mining company landholdings further lowers the rate base (URS 2005). Worse still, these Shires are not even providing all the services other LGAs in Australia do. Because of incomplete normalisation, PI still assumes responsibilities for a significant number of amenities and services in these towns.

Table 5.17 – Source of revenue, Roebourne and Ashburton

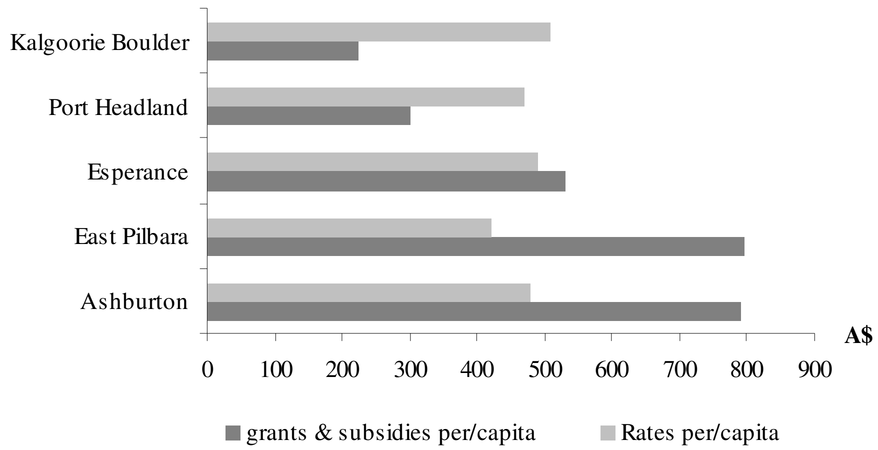
Source: Ashburton and Roebourne shire annual reports (02/03 & 03/04)

	2002/03		2003/04	
	Roebourne	Ashburton	Roebourne	Ashburton
Grants & subsidies	$4,847,867	$5,756,107	$6,215,607	$5,438,914
Reimbursements and donations	$294,434	$338,417	$428,086	$179,305
Rates	$6,383,869	$3,084,777	$7,004,260	$3,324,262
Fees & charges	$7,571,030	$1,041,328	$9,347,834	$2,538,913
Profit on asset disposals	$155,498	$40,520	$188,320	$3,348
Interest earnings	$220,143	$97,770	$330,199	$180,016
Other revenue	$788,222	$433,452	$980,599	$293,571
Total	$20,261,063	$10,792,371	$24,494,905	$11,958,329

Revenue from grants and subsidies in the Shire of Roebourne made up 22% and 28% of total expenditure in 2002/03 and 2003/04, and as much as 60% and 46% in the Shire of Ashburton. These Shires are much more dependent on grants and subsidies than is normally the case with LGAs. As an illustration, Figure 5.11 compares the dollar value of grants & subsidies and rates per head of population in Ashburton to selected LGAs. The Commonwealth Grants Commission (CGC) is a statutory authority operating under the CGC Act 1973 with their mandate being to distribute, among the States and Territories, the pool of general revenue assistance made available by the Commonwealth. These funds are distributed through the Western Australian Local Government Grants Commission (WALGGC). State funding is divided into two parts, an equalisation component and a local roads component. The funding is allocated on the basis of horizontal equalisation, to ensure that each local government in the State is able to function at a standard not lower than the average standard of other local governments (DLGRD 2006).

Figure 5.11 – Grants/subsidies & rates per capita, selected LGAs, 2003/04

Source: LGA Annual Reports 2003/04



In the case of the Pilbara a grant system that was probably intended to supplement revenues has become a major source of revenues for Ashburton and Roebourne. Although it allows for small capital expenditures, it does not provide the means of raising the funds to meet the recurrent costs. Also, the Shires dependency on grant funding that can change from year to year makes planning through forward budgeting impossible. The Shires are locked into a fixed pattern of costs associated with their asset management responsibilities and are not in a position to launch new initiatives. They can only try to extract more money from government or the company to cover existing liabilities.

In turn, the PI approach to infrastructure management is ultimately driven by the cyclical demands for housing and employee retention. Table 5.18 summaries Pilbara Iron's current involvement in town infrastructure. As a result of incomplete normalisation, PI still retains key responsibilities for provision of township utilities in the towns, which is generally a requirement of the State Agreements under which the company operates. The company is responsible for the majority of infrastructure in Dampier and Wickham and virtually all the infrastructure in Pannawonica. PI is still responsible for some infrastructure in the towns of Tom Price and Paraburdoo. Under these circumstances, it seems unlikely that local governments will be in a position to take on these responsibilities from PI, as endorsed by the normalisation process under way. Roebourne and Ashburton Shires would face serious challenges in meeting future financial targets for maintenance and upgrade of infrastructure.

Table 5.18 – Overview of Pilbara Iron's responsibilities in town operations

Source: Piper (2005)

Town	PI Responsibilities for town infrastructure
Dampier	Company is still responsible for the majority of infrastructure due to limited Shire involvement.
Tom Price	Company is still responsible for electricity, sewerage and water (along with other assets not transferred in final normalisation agreement).
Paraburdoo	Company is still responsible for electricity, sewerage and water (along with other assets not transferred in final normalisation agreement).
Wickham	The majority of infrastructure is owned and maintained by Robe and the Shire has responsibility for some sections of the town (areas with Homeswest housing, some private buildings, school, hospital etc).
Pannawonica	All the infrastructure owned and maintained by Robe, with the exception of the access road from the highway which the Shire maintains.

5.4. The people of the Pilbara

Prior to the latest mining boom, the total population in the Pilbara had been decreasing. There were 43,000 people living in the area in 1993, which went down to 39,500 by 2003, approximately 2 per cent of the population of WA. Not all segments of the analysis have behaved similarly, however. Population in coastal areas have either remained stable or even increased (Roebourne and Port Hedland). Also, increases in Aboriginal population have partially compensated the overall declining trend. With 6,514 people, the Aboriginal population constituted 16% of the total Pilbara in 2001 (Taylor and Scambary 2005). Looking forward, as the mining expansion increased the demand for mineworkers, headcounts in the region started to rise again. The WA Planning Commission estimates that the population of the Pilbara will grow by 0.8% per year in the period 2001-16, though it will then slow down again to 0.4% between 2016 and 2031. In essence, like many other variables in this region, population growth in the Pilbara is a cyclical phenomenon.

Table 5.19 – Population: Western Australia and Pilbara region

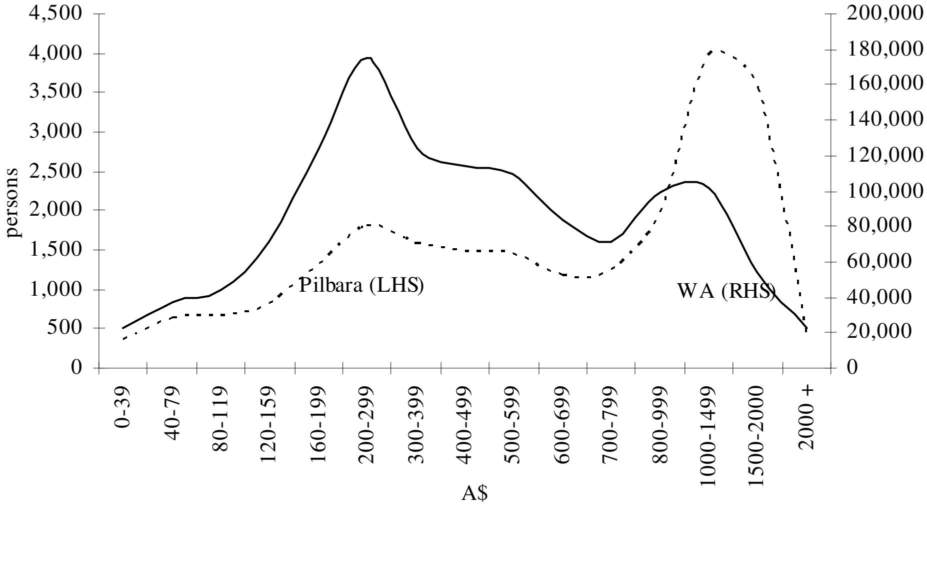
Source: Pilbara Development Commission, Australian Bureau of Statistics

Shire	1993	1995	1997	1999	2001	2003
Ashburton	7,201	7,329	7,369	6,503	6,888	5,781
East Pilbara	8,959	7,372	7,046	6,819	6,786	5,682
Roebourne	14,909	14,038	13,983	14,507	15,974	15,281
Port Hedland	12,542	12,134	12,821	13,248	13,099	12,785
Pilbara	43,611	40,873	41,219	41,077	42,747	39,529
WA	1,677,700	1,733,787	1,798,129	1,857,586	1,901,159	1,952,238

Generally, the Pilbara residents have higher incomes than the average in WA. According to the census 2001, the average income in the Pilbara was A$46,976 compared to A$33,620 in WA. The reason for this disparity is the generally skilled nature of employment in the Pilbara – in addition to the fact that mining companies typically have to offer higher salaries to attract personnel to the region. 90% of the income is derived from wages and salaries, and the rest split between government cash benefits (mainly for Indigenous people), own incorporated businesses, superannuation and annuities. Income from other investments (i.e. interests paid to financial institutions, net rent and dividends, and corporate or public trusts) is negligible in comparison (ABS Catalogue 6524.0).

Figure 5.12 – Income distribution in the Pilbara and WA, A$ per week/person (2001)

Source – ABS Census 2001



Income is not evenly distributed. A polarised Pilbara economy has resulted in a polarised community, with three distinct classes whose sources of employment determine their income and area of residence (Taylor and Scambary 2005). The three classes coexist with minimum interaction, separation mirrored in the physical layout of residences in the towns. First are the mineworkers. In PI towns, these are principally PI workers, though a number of employees from other companies live here as well (i.e. energy producer Woodside, BHPB, and Rio Tinto's Dampier Salt). URS (2005 p3) identified a '[…] *lack of vision for the towns and a lack of community energy and spirit*' among these people. In addition to the generally aging and rapidly deteriorating infrastructure, which explains general dissatisfaction over town services, the lack of community participation is a reflection of the way in which the majority of residents regard life in the Pilbara: short term and of a single purpose. Most mineworkers go to the Pilbara with the idea of saving money and then return to Perth. This is exacerbated by the long work hours, the existence FIFO arrangements, poor career prospects for spouses and partners, and lack of support services predominantly in the area of health and education (URS 2005).

Second are the European non-mining residents. This group is made up of service providers, small entrepreneurs, their employees and public servants. The dominant factor facing small businesses is operating in a polarised economy, and trying to prosper in a market with notoriously high labour costs, high housing and living expenses. These elements constitute clear constraints on expansion or diversification of the regional economy. The labour market for small businesses and government is typified by difficulties to attract and retain good staff. The high cost of housing and electricity (summers are extremely hot) means that it is very difficult to attract people to low paid positions. The poor quality of benefits provided to public servants has resulted in a high turnover in the public sector staff (doctors, teachers, nurses etc).

These two groups constitute the bulk of the non-Indigenous people. A number of demographic characteristics within this population set the Pilbara apart from the rest of Western Australia, including:

- A volatile level of population, which is directly influenced by resource activities. In particular, the influx of temporary workforce during the construction phases of large projects causes community populations to peak.
- A demographic profile that tends to be skewed to the 25-45-age cohort and towards the male gender (ABS 2001)
- A relatively high turnover. Less than half of the Pilbara population living in the region in 2001 were living in the region in 1996. Almost 40% of the population in 2001have only moved to the Pilbara in the previous 5 years (ABS 2001)
- A high level of education. The Pilbara has the highest proportion of people with vocational qualifications (20%) in Western Australia (mineworkers are increasingly high-skilled)
- The highest level of labour force participation in Western Australia at 78% (basically, people go to the Pilbara with jobs)

Most non-Indigenous people move to the Pilbara with the initial purpose of making money. Overall they have a relatively high marginal propensity to save, though very little seems to be reinvested in the Pilbara. In conversation with non-Aboriginal residents the point is regularly strongly made that '*Most saving is still outside the region. There is little investment locally* […] *Shopping is 50:50 local and in Perth. You can get most products locally, but people often want a trip to Perth and shopping can provide a good reason*' (non-Aboriginal resident I, 2005). The ability to save seems highly variable though, and further conversations have suggested that many people have poor financial management skills and are easily stuck in a cycle of consumption, largely focussed on luxury goods. '*Financial management and lack of savings is a problem across the community – Indigenous and non-Indigenous. There are high levels of indebtedness and gambling is a problem.* […] *Some people get into problems with overspending and high debt levels. These debts are not investments but associated with consumption of big cars and boats*' (non-Aboriginal resident II, 2005).

Finally, most people in these categories come for a short period and then choose to stay longer: '*Most people come with a two year plan which changes later to a five* *year plan or more*' (non-Aboriginal resident III, 2005). More generally, locals claim that it is possible to think of these people as falling into four groups. They frequently refer to the terms: two, five, ten and twenty-year-people. Two year people survive two winters and one summer. They find the heat excessive. Five year people come with a clear savings goal. They reach that goal and leave. Ten year people come for five years, they then like the lifestyle, and stay for ten. When they leave it is usually for family reasons – usually lack of educational opportunities for youngsters. The 20 year people may have come for the money, but are seduced by the quiet lifestyle (URS 2005).

5.4.1 The Aboriginal community

The third category of Pilbara residents is the Indigenous population, whose participation in the local labour force is very low[79]. Taylor and Scambary (2005) note that despite substantial growth in economic activity in the Pilbara since the 1960s, the overall employment rate for Indigenous people rose only slightly from 38 per cent of all adults in 1971 to just 42 per cent in 2001. Curtin University (2005) suggests that Indigenous employment share at all mine sites might be as low as 2% to 3% of the total (despite the many programs targeted at increasing Aboriginal employment PI had 89 direct Aboriginal employees in 2004, less than 3% of its total labour force) . In absolute terms, Indigenous employment increased from 814 in 1971 to an estimated 1,808 in 2001. However, much of this growth was due to their increased participation in the CDEP scheme[80].

Taylor and Scambary (2005) write that the majority of the Indigenous population remains largely dependent on welfare, structurally detached from the labour market, and ill-equipped to engage with it. There are no individual savings in these communities, and local private investment and credit activities are extremely low. Aboriginal marginal propensity to consume is large – any cash surplus is shared

[79] 6% of the formal employment in 2001, according to the ABS (2001)
[80] The Community Development Employment Projects (CDEP) is a subsidised governmental labour scheme by which beneficiaries contribute with community work for a fixed salary. CDEP provides employment and training opportunities for indigenous Australians who voluntarily forgo their income support from the government. CDEP also offers opportunities for Indigenous people to establish their own businesses.

within the communities for consumption. As a result, the accumulation process does not take place in these communities (Martin 1995, 2001). Accordingly, only 14% of dwellings are fully owned or being purchased by Indigenous people, while as much as 80% of their accommodation is rented. This is indicative of their relatively low economic status, although some commentators have argued that this may also be an expression of a cultural inclination for collective forms of tenure (URS 2005).

Chronic diseases such as cardio vascular, cancer, chronic pulmonary and diabetes have become the predominant causes of indigenous mortality in the Pilbara (Taylor and Scambary 2005). The number of diabetic Indigenous persons is almost equivalent to the numbers in mainstream employment. A serious implication for the private sector is the ability of these individuals to participate in the mainstream economic activity. Likewise, the total number of Indigenous people arrested in the Pilbara is almost equivalent to the total number of Indigenous people aged 15-45 estimated to be employed in the mainstream regional labour market.

Figure 5.13 - Income distribution in the Aboriginal communities, A$ per week/person

Source: ABS Census 2001

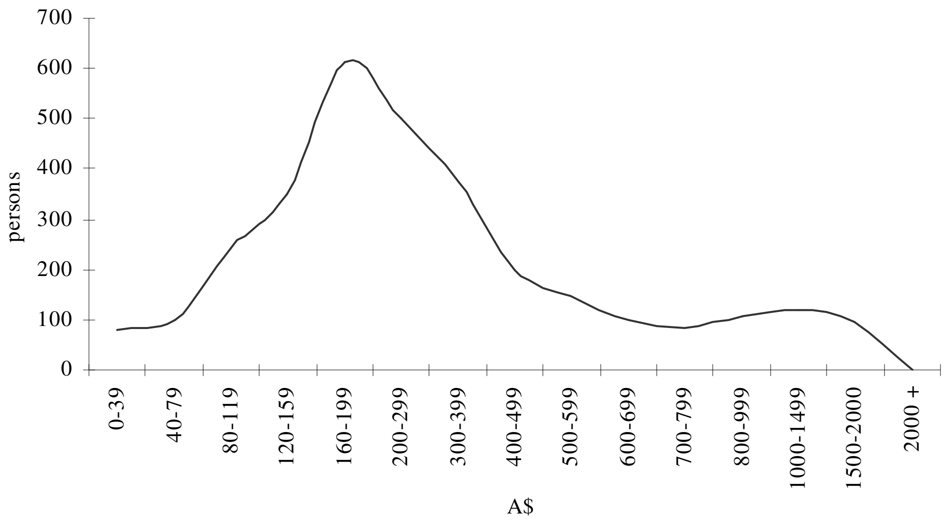


Figure 5.13 shows the distribution of income of the Aboriginal communities in the Pilbara. Most Aboriginal people earn between A$120 and A$399 per week. The 2001 census revealed that these incomes were around one third of those of non-Aboriginal people in the region. The source of Aboriginal income is fundamentally CDEP. Apart from this, the Aboriginal labour force is prominent in the pastoral industry. There are

still a number of pastoral leases held by or on behalf of Aboriginal people in the Pilbara. These properties provide economic benefits to Aboriginal people through beef and cattle production but also the provision of government services to the communities that live on the properties and through the operation of community stores. There is also some tourism, and art & craft related economic opportunities associated with the pastoral industry.

Table 5.20 – Labour force status, Indigenous and Non-Indigenous

Source: Taylor and Scambary 2005

Labour Force Status - 15 years old and over	Indigenous Males	Indigenous Females	Indigenous Persons	Non-Indigenous Males	Non-Indigenous Females	Non-Indigenous Persons
% Employed by CDEP	22%	19%	21%	0%	0%	0%
% Employed Other	78%	81%	79%	100%	100%	100%
% in Labour Force Employed	84%	85%	85%	96%	95%	96%
% in Labour Force Unemployed	16%	15%	15%	4%	5%	4%
% in Labour Force	52%	41%	47%	85%	65%	76%
% Not in Labour Force	43%	55%	49%	15%	35%	23%
% Not Stated	4%	4%	4%	0%	1%	1%

Several Aboriginal small and medium enterprises (SMEs) have been established in recent years to service the resource sector and related activities. There are also a few other Aboriginal businesses from a range of industries (Table 5.21). In addition, most non-Aboriginal companies in the region are targeting Aboriginals as employees. A number of Aboriginal communities have entered into agreements with mining companies under the Native Title Act 1993 that provides for ongoing financial assistance representing an important source of income for this population. In particular, PI has an Indigenous Land Use Agreement with Gumula Aboriginal Corporation, representing the native title claimants of the land, for the establishment of the Yandicoogina Mine, and relates to an area comprising 26,000km2 (PI Community Affairs 2006).

Table 5.21 – Key Aboriginal owned businesses in the Pilbara (2004)

Source: Pilbara business directories and local references

Company	Total employees	Aboriginal employees	Industry	Clients
Ngarda Civil Mining	90	78		BHPB, PI
Gumula			Earthmoving, catering and equipment hire	PI
Bridda	23	20	Equipment, labour hire	PI
Excel Resources	15	4	General cleanup	BHPB
Indigenous Mining Resources			Labour hire and mining services	BHPB
Abment Holdings	2	2	Employment & training for Aboriginals	
IBN Corporation			Employment & training for Aboriginals	IBN and others
Nyamal Crane Hire Pty Ltd				Brambles
Headland Sampling				
Ieramugadu Gardening Services			Gardening & maintenance	PI
Karajini Walkabouts			Tours at Karajini National Park	

Is more mining good news for the Aboriginal people? The recent escalation of mining activity in the Pilbara is the largest that has ever taken place in Australia. Large mining companies operating in the region have recognised that major social and economic impacts to Aboriginal communities should be expected, and that visible welfare improvements in these communities would provide the necessary foundations for a social licence to operate. However, despite PI's commitment to SD, and in particular a level of investment in the communities that is – relative to value of production – larger than anywhere else in the Group, very little has been achieved in terms of enhancing Indigenous socioeconomic status in the Pilbara since the early 1970s (Taylor and Scambary 2005). Anecdotal conversation with Aboriginal residents of Pilbara towns often reinforces this view: '*The companies don't do enough for our people. This is our land. They have to do more for our communities, and give the Aboriginal people more jobs*' (Aboriginal resident I, 2005)

Companies often claim that it is extremely difficult for them to find more Indigenous people with the practical skills necessary to work in the mines, which is what explains the low ratios of Aborigines among mining workers. It has also been claimed that the government's CDEP program may play against company efforts to increase their proportion of Indigenous people in the formal workforce, as this subsidy may represent a stimulus not to get engaged in the mainstream labour force. In addition, the social ownership of individual income amongst Indigenous people means that the individual financial incentive is diluted, meaning that the Aboriginal obligation to share wealth or resources with extended families can reduce the incentive to work for a wage (Pearson 2000, Martin 2001). When asked about the deterring effects of CDEP on jobseekers, however, another Aboriginal resident and PI employee maintained that '*The incentive to work in a real job is there. Salaries paid by PI can come up to several times the income from government subsidies*' (Aboriginal resident II, 2005)

In turn, welfare standards that are substantially below the average in the region have contributed to the lack of assimilation described earlier. Many of the residents in these communities find the origin of this problem associated to the saving and expenditure patterns of Aboriginal people. A number of interviews conducted during 2005 illustrate these perceptions: *'Most Indigenous people don't know how to save; they just spend the money when it is there'* (non-Aboriginal resident IV, 2005). When queried about the nature of this expenditure, a general perception among non-Aboriginals seems to be that pressure from extended families to share the income of those in the formal labour force tends to play a key role in their inability to invest in productive activities. '*They have to learn how to say no to family requests'* (non-Aboriginal resident V, 2005). Accordingly, Martin (2001) has claimed that the marginal propensity to consume in Aboriginal communities in Australia is close to 100%, and thus their investment capacity is almost inexistent.

These comments have been linked back to some fundamental cultural features in these communities. Martin (2001) explains that having been hunter communities until fairly recently, the notion of savings has little practicality; meat rots quickly and so surpluses were to be shared. Many westerner political and economic arrangements and institutions have since been incorporated into the indigenous systems, although filtered and adapted to aboriginal values. Cash is an example of this: cash surplus - as meat was in the past-, is frequently shared within the local population for consumption (e.g. Martin 1995, 2001). In addition, there are few available instruments for saving cash. For example, the local councils issue payments for those in the CEDP program weekly, but there are typically no bank branches or cash machines in the Aboriginal settlements outside the towns (McDonnell 2001). Corroborating this point, another local resident said that '*Some community stores manage the finances of many Aborigine people; they are like financial centres for* *them. These stores are often the only link into the market economy for many in isolated communities'* (non-Aboriginal resident VI, 2005)

Thus far, it is not apparent that the practical implications of these cultural differences have been fully appreciated and incorporated into a more targeted policymaking process. Altman (2001) describes these remote Aboriginal economies as 'hybrid economies', made up of the market, the state and customary components. He argues that the essence of the problem with Aboriginal development in these places is that this type of hybrid economy is in general poorly understood by politicians, companies, and even Aboriginal people and their representative organisations. It follows that policies based on market engagement delivered to communities that are extremely remote from markets, both in location and cultural terms, are destined to fail. The actual meaning and repercussions of 'modernity' in the context of these native districts has yet to be fully discovered (Altman 2001)

5.5. Implications for the state and local economies

The current PI's expansion constitutes a huge capital inflow into a region that already specialises in mining. This new investment will be expected to impact the existing land-access agreements, the broader regional infrastructure, the regional housing system and local agglomeration patterns. It will also affect the already delicate social structure at the local level. In addressing these emerging challenges, PI has pledged to embrace the SD model. The company has had a fundamental advantage in doing so: The local meaning of sustainability was in this case unambiguously predefined – it translates here to the supporting of the government's vision for a sustainable and independent community and its underpinning economy. In the light of this, then, is Pilbara Iron contributing towards economic sustainability?

In absolute terms, PI's contribution to the economy of Western Australia is very significant. This study showed that this predominantly takes the form of taxes and royalties and a strong demand for operating supplies from a vast network of State businesses, which accounts to more than half of the annual purchases by the company. Similarly, while virtually all wages and salaries are paid to residents of the Pilbara, the ultimate effect of these payments locally appears to be substantially moderated by high levels of income leaking out of the circular flows – in particular, a high marginal propensity to save where the income is higher combined with an investment pattern that seems to have Perth as final destination. With regards to the capital component of value added (i.e. dividends and interest payments), it should not be surprising that both the financial sector and company shareholders, again, have a much larger presence in the State than at the local level of the operations.

This study has found that the structure of the regional economy largely explains why most of the economic contributions from the company fly away from the local economy. The Input/Output analysis introduced in section 3.1 showed that an increase in production in the Pilbara has larger flow-on effects in the rest of WA than in the Pilbara itself. In their quest for local economic sustainability, the different economic players have tried to compensate for this trend by relying on the indirect effects of mining and thus have favoured import substitution from local suppliers and services. There are, however, no evident comparative advantages encouraging the emergence of upstream economic activities in the Pilbara. Likewise, issues such as the relative scale of the local and State economies, geographic and demographic characteristics, as well as the prevailing composition of the local supply chain, have so far played against economic diversification.

In the Pilbara itself, economic benefits from mining come principally from the construction of houses and other town infrastructure and its maintenance. (It is worth reiterating, however, that these are still largely mining towns). Likewise the large investments taking place on the dedicated iron-ore ports and railway are exclusively aimed at increasing mining capacity and thus benefits are not directly reaped by other economic players. As discussed, also, while there is a fraction of labour payments destined to local consumption, the bulk of personal savings and investment still flows to the State. With regards to the direct contributions to government, apart from rates levied on local house ownership, taxes and other duties are fundamentally paid to the State and Federal governments.

Two fundamental dilemmas faced by PI stick out from the rest at the local level: the precarious living standards of local Aboriginal population, and the financial and administrative uncertainties surrounding the so-called ‘normalisation’ process taking place in PI towns. With a very restricted pool of skilled local workers from which to recruit, employment by mining companies could offer a unique opportunity for Aboriginal people with few other sources of income available. However, cyclical peaks in labour demand have been for the most part filled by immigrants. Despite company and government efforts, Aboriginal employment outside CDEP remains very low. This has been often linked to strong cultural differences between Aboriginal practices and companies’ skills requirements. While numerous academic commentators have elaborated on the intrinsic difficulties of this relationship, policymakers within government, companies or Indigenous communities have yet to come up with innovative governance responses that are effective on the ground.

The problems around normalisation point out to another failure in the existing systems of governance locally. State agreements have assumed that normalisation in Pilbara towns will occur when PI hand over assets in good condition and some funds for maintenance during a transition period, although a closer analysis of the towns’ finances suggests that significantly expanding the Shires’ responsibilities will not be financially sustainable any time soon. The LGAs in question have higher expenditures as a percentage of asset value than their peers. So far, this extra expenditure has been financed by grants and subsidies from government, and by PI. In practice, the existing demarcation of roles and responsibilities in the towns has largely been defined by the status of normalisation in each case, but more significantly by the Shires’ capacity, ability, and predisposition to carry out required tasks in each location. A recent assessment of ‘normalised’ towns indicates that the PI towns are still overly reliant on trends in the mining industry, principally its labour force (Pipper 2005). In turn, unresolved normalisation processes have resulted in a situation where all stakeholders are limited in their ability to implement effective long-term planning.

In tackling these issues, what has been the role of PI’s direct investment in the communities (CI) – arguably the most discretionary company instrument to advance issues of economic development? While minuscule in relation to the total flow of capital generated by the company, this contribution by PI is still very significant when compared to other Rio Tinto businesses. In accordance with SD rhetoric the company has minimised the philanthropic component of CI, and donations are today a tiny portion of the total. The bulk of ‘capital transfers’, accounting for 18% of the total, goes to Aboriginal trusts for intergenerational development, which are then managed by an independent board of trustees subjected to independent regulation. These payments represent an important source of income for Aborigines, though there is no clear evidence that they have yet helped change the structural disadvantage of these communities. Yet, the largest portion of CI actually goes to the maintenance of towns and their infrastructure, often more associated to human resources than community initiatives, as they can be seen as a necessary investment for attracting and retaining employees in remote areas.

Up until now, the three Pilbara communities described in this paper do not seem to share a common vision for the future of the region. While the government’s plan for the Pilbara argues that a robust and sustainable community is possible in these towns, a significant expansion of mining activities will likely accentuate, rather than narrow, the socio-economic gap between the three distinctive groups.

5.6. Final remarks

This analysis has shown that the established vision of long-term sustainability for the existing Pilbara communities beyond the extractive industry, so determinately endorsed by the government and PI, rests in fact on wobbly foundations. This understanding should lead to revisiting the regional strategy towards the towns’ normalisation, regional infrastructure, housing and FIFO practices by mining companies, as well as other issues such as Aboriginal employment, the welfare system and CDEP. Assuring sustainable economic development in the Pilbara will require much more than good CSR practices on behalf of PI. It will rather demand readdressing broad strategic decisions that are, regrettably or not, beyond the mandate of a single company. A new consensual strategy for the future of the region should be based on facts and not on an idealistic representation of how the region looks like and what its economic potential really is.

The question should also be posed whether a sustainable Pilbara economy, as currently defined, is ever going to be possible – or even desirable. Western Australia – and in fact the Pilbara on its own- is broadly referred to as a mining cluster due to the large concentration of world-class ore bodies (Eggert 2001). Providing that technology continues to bring previously unfeasible deposits into production, there should be sufficient mineral resources in the region for mining to continue in the foreseeable future (Dames & Moore 2000, Mining Journal, various issues 2005 and 2006). Care should then be taken when defining what makes for sustainability in this place. In the case of isolated mining clusters like this one, economic sustainability may be better served by shifting the focus of the policy responses (i) from individual mines to the overall mining sector (e.g. by allowing labour and capital to follow the geographic logic of mining operations freely), and (ii) from the very local level to the broader region (for instance, by concentrating efforts on the consolidation of a strong supply chain around Perth)

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Non-Aboriginal resident II, interview conducted in the Pilbara in March 2005

Non-Aboriginal resident III, interview conducted in the Pilbara in March 2005

Non-Aboriginal resident IV, interview conducted in the Pilbara in March 2005

Non-Aboriginal resident V, interview conducted in the Pilbara in March 2005

Non-Aboriginal resident VI, interview conducted in the Pilbara in March 2005

Appendix 5.1 – Pilbara Iron payments to suppliers in 2004

The following items present the complete list of PI operating purchases of materials and services, organised by Category, as recorded by PI Procurement. In 2004, this expenditure was equivalent to A$915 millions. Note that the top five items together accounted for almost 60% of the total value. The first 34 items, in turn, accounted for 95% of the total.

	Description	
1	Fuel	
2	Contractors (Mining, civil, drilling & marine)	
3	Rail - Parts & Components	
4	Mechanical Parts	
5	Truck - Parts & components	58%
6	Explosives & Accessories	
7	Professional Services	
8	Building Maintenance Service	
9	Travel	
10	Electric Supplies	71%
11	Industrial Supplies	
12	Catering	
13	Natural Gas	
14	Consulting Services	
15	Road freight	81%
16	Chemicals	
17	Tyres	
18	Legal Services	
19	Lubricants	
20	Training Services	
21	IT Services	
22	Building Lease	
23	Trucks Maintenance Service	
24	Safety Consumables	
25	Plumbing Maintenance	
26	Trucks Maintenance Service	
27	Locomotive Parts (HME)	
28	Grounds Maintenance Service	
29	Hydraulic Equipment & Components	
30	Plant Maintenance Service Mechanical	
31	Electricity	
32	Telecommunications	
33	PC, Software and Related	
34	Pipes/Valves/Fittings	95%
35	Office Equipment & Maintenance	
36	Metal, Fabrication Products/Services	
37	Advertising/Marketing Service	
38	Industrial Engines Parts	
39	Water	
40	Medical Services	
41	Consumables	
42	Hotel/Accommodations	
43	Site Services	
44	Plant Maintenance Service Electrical	
45	Lab Supplies	
46	Plant Maintenance Service Water Treatment	
47	Sand/Gravel	
48	Industrial Gases	
49	Office Supplies	
50	Car Hire / Rental Car	
51	Risk Management Services	
52	Employee Transportation Service	
53	Publications	
54	Security Services	
55	Insurance	
56	Accounting/audit/tax Service	
57	Timber/Wood Products	
58	Clothing/Uniforms	
59	Travel Agency Services	
60	Packaging	
61	Couriers	
62	Health Insurance	
63	Plant Maintenance Service Rail Track	100%

Appendix 5.2 – Input/Output tables and multipliers

In 2004, Rio Tinto commissioned to Acil Tasman the production of I/O tables for Western Australia and the Pilbara (Acil Tasman 2005). The resulting tables were derived by the following process:

1. An input-output table for Australia for 1996-97 was updated to 2001-02 (The 1996-97 Australian input-output table was used as the basis for this approach rather than the 1998-99 table so as to make use of the 1996 census data)
2. An input-output table for Western Australia and for the Pilbara were then generated using a modified cross-industry quotient method.

The 2001-02 Pilbara input-output tables contains:

- Rio Tinto's iron ore operations as a separate industry;
- Rio Tinto's salt operations as a separate industry;
- 83 Pilbara-based industries (including the two Rio Tinto industries).

Flow-on impacts or I/O multipliers

The input-output multipliers are derived from the I/O tables, and they are used to estimate the economic impact from a one dollar change in the final demand (consumption, government spending, investment and exports) due to the change in output in one of the region's industries. The total economic impact identified by use of input-output multipliers includes the direct effect of the initial increase in demand and the indirect (or 'flow-on') effects. The flow-on effects result from the linkages between industries in the regional economy. For example, transport service providers in the Pilbara purchase inputs from other local industries. When demand for their output increases, the transport companies will increase their purchases from other local businesses, who themselves must increase their consumption, some of which will be from other local firms, and so on. Multipliers are normally used to measure impact on output, income, value added and employment.

There are different types of multipliers. When additional sales to final demand (consumption, government spending, investment and exports) are made, for example through increased exports or sales to the public, production increases to meet the increased demand, and this produces the initial effect. Since production increases to exactly match the increased final demand, the output initial effect is always equal to one. The income initial effect is given by the share of wages and salaries in total costs; value added is similarly defined and includes wages and salaries, profits and indirect taxes. Output, income and value added multipliers are all defined in terms of dollar change per dollar stimulus, and they are therefore without units. Employment type 1 and type 2 multipliers are defined in terms of total jobs per job created and are also without units. However, employment initial effects, simple and total multipliers are defined in terms of jobs per dollar - i.e. jobs per thousand dollars of increased final demand in this case.

The industry producing the additional output makes purchases to achieve increased production, and these new purchases are met by production increases in other industries. These production increases cause other industries to increase their purchases, and these purchases cause other industries to increase their production, and so on. These flow-on effects eventually diminish, but when added together with the initial effect produce the simple multiplier.

This chain of events has ignored one important factor: the effect on labour and its consumption. When output increases, employment increases, and increased employment translates to increased earnings and consumption by workers, and this translates to increased output to meet the increased consumption. This consumption effect added to the simple multiplier produces the total multiplier.

All the effects and multipliers mentioned so far have had one thing in common: they all measure the impact on the economy of the initial increase in final demand. Then, type 1& 2 multipliers are ratios of the abovementioned multiplier types. The type 1 multiplier is the ratio of the simple multiplier to the initial effect. The type 2 multiplier is the ratio of the total multiplier to the initial effect. For reference, the tables below contain the full set of output, income, value added and employment multipliers for Western Australia and the Pilbara (Acil 2005).

Western Australian output multipliers

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Sheep	1.0000	1.4275	1.4275	1.6746	1.6746
Grains	1.0000	1.3745	1.3745	1.5656	1.5656
Beef cattle	1.0000	1.5154	1.5154	1.8497	1.8497
Dairy cattle	1.0000	1.8933	1.8933	2.2735	2.2735
Pigs	1.0000	1.7168	1.7168	2.1128	2.1128
Poultry	1.0000	1.8036	1.8036	2.2016	2.2016
Other agriculture	1.0000	1.5008	1.5008	1.8545	1.8545
Services to agriculture; hunting and trapping	1.0000	1.4002	1.4002	1.9653	1.9653
Forestry and logging	1.0000	1.8310	1.8310	2.4872	2.4872
Commercial fishing	1.0000	1.5569	1.5569	1.9084	1.9084
Coal	1.0000	1.6205	1.6205	2.1797	2.1797
Oil & gas	1.0000	1.2696	1.2696	1.4385	1.4385
Iron ores	1.0000	1.3619	1.3619	1.6691	1.6691
Non-ferrous metal ores	1.0000	1.5303	1.5303	1.8833	1.8833
Other mining	1.0000	1.5642	1.5642	1.9130	1.9130
Services to mining	1.0000	1.5065	1.5065	2.0045	2.0045
Meat and meat products	1.0000	2.0156	2.0156	2.5370	2.5370
Dairy products	1.0000	1.8780	1.8780	2.2944	2.2944
Fruit and vegetable products	1.0000	2.1417	2.1417	2.7428	2.7428
Oils and fats	1.0000	1.8993	1.8993	2.3230	2.3230
Flour mill products and cereal foods	1.0000	2.1277	2.1277	2.6155	2.6155
Bakery products	1.0000	2.0026	2.0026	2.7226	2.7226
Confectionery	1.0000	1.9762	1.9762	2.6751	2.6751
Other food products	1.0000	1.9532	1.9532	2.4673	2.4673
Soft drinks, cordials and syrups	1.0000	2.1305	2.1305	2.7301	2.7301
Beer and malt	1.0000	1.9684	1.9684	2.3651	2.3651
Wine and spirits	1.0000	1.6301	1.6301	1.9964	1.9964
Textile fibres, yarns and woven fabrics	1.0000	1.9688	1.9688	2.4951	2.4951
Textile products	1.0000	1.7421	1.7421	2.3897	2.3897
Knitting mill products	1.0000	1.7781	1.7781	2.4527	2.4527
Clothing	1.0000	1.4934	1.4934	2.0350	2.0350
Footwear	1.0000	1.3905	1.3905	2.0003	2.0003
Leather and leather products	1.0000	2.0855	2.0855	2.6593	2.6593
Sawmill products	1.0000	1.8126	1.8126	2.4320	2.4320
Other wood products	1.0000	1.9177	1.9177	2.6552	2.6552
Pulp, paper and paperboard	1.0000	1.8358	1.8358	2.3740	2.3740
Paper containers and products	1.0000	1.6456	1.6456	2.1906	2.1906
Printing and services to printing	1.0000	1.8326	1.8326	2.5281	2.5281
Publishing; recorded media and publishing	1.0000	1.7673	1.7673	2.4702	2.4702
Petroleum and coal products	1.0000	1.6142	1.6142	1.7656	1.7656
Basic chemicals	1.0000	1.7768	1.7768	2.2030	2.2030
Paints	1.0000	1.7015	1.7015	2.2060	2.2060
Medicinal and pharmaceutical products, pesticides	1.0000	1.8459	1.8459	2.3812	2.3812
Soap and detergents	1.0000	1.9680	1.9680	2.5206	2.5206
Cosmetics and toiletry preparations	1.0000	1.9302	1.9302	2.5394	2.5394
Other chemical products	1.0000	1.9039	1.9039	2.4513	2.4513
Rubber products	1.0000	1.7584	1.7584	2.4146	2.4146
Plastic products	1.0000	1.8450	1.8450	2.4543	2.4543
Glass and glass products	1.0000	1.7989	1.7989	2.4577	2.4577
Ceramic products	1.0000	1.7169	1.7169	2.3515	2.3515
Cement, lime and concrete slurry	1.0000	2.1918	2.1918	2.7681	2.7681
Plaster and other concrete products	1.0000	1.9840	1.9840	2.6335	2.6335
Other non-metallic mineral products	1.0000	1.9824	1.9824	2.6393	2.6393
Iron and steel	1.0000	2.1133	2.1133	2.7137	2.7137
Basic non-ferrous metal and products	1.0000	1.9649	1.9649	2.3616	2.3616
Structural metal products	1.0000	1.9873	1.9873	2.6905	2.6905
Sheet metal products	1.0000	2.1157	2.1157	2.8494	2.8494
Fabricated metal products	1.0000	1.9585	1.9585	2.7458	2.7458
Motor vehicles and parts; other transport equipment	1.0000	1.7929	1.7929	2.2968	2.2968

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Ships and boats	1.0000	1.5839	1.5839	2.1075	2.1075
Railway equipment	1.0000	1.9071	1.9071	2.6570	2.6570
Aircraft	1.0000	1.2237	1.2237	2.0797	2.0797
Photographic and scientific equipment	1.0000	1.8639	1.8639	2.6593	2.6593
Electronic equipment	1.0000	1.4516	1.4516	1.9510	1.9510
Household appliances	1.0000	2.0280	2.0280	2.6382	2.6382
Other electrical equipment	1.0000	1.9171	1.9171	2.5985	2.5985
Agricultural, mining and c	1.0000	1.7850	1.7850	2.4487	2.4487
Other machinery and equipment	1.0000	1.8497	1.8497	2.6130	2.6130
Prefabricated buildings	1.0000	1.5507	1.5507	1.9950	1.9950
Furniture	1.0000	1.7374	1.7374	2.4415	2.4415
Other manufacturing	1.0000	1.7835	1.7835	2.4504	2.4504
Electricity supply	1.0000	1.7714	1.7714	2.1671	2.1671
Gas supply	1.0000	1.4564	1.4564	1.9236	1.9236
Water supply; sewerage and drainage services	1.0000	1.5604	1.5604	1.9447	1.9447
Residential building	1.0000	1.7767	1.7767	2.2413	2.2413
Other construction	1.0000	1.6351	1.6351	2.2999	2.2999
Wholesale trade	1.0000	1.8466	1.8466	2.7503	2.7503
Retail trade	1.0000	1.7227	1.7227	2.6349	2.6349
Mechanical repairs	1.0000	1.4650	1.4650	2.0341	2.0341
Other repairs	1.0000	1.3337	1.3337	1.9187	1.9187
Accommodation, cafes and restaurants	1.0000	1.8682	1.8682	2.5912	2.5912
Road transport	1.0000	1.7764	1.7764	2.4500	2.4500
Rail, pipeline and other transport	1.0000	1.8315	1.8315	2.8101	2.8101
Water transport	1.0000	1.7498	1.7498	2.2067	2.2067
Air and space transport	1.0000	1.9213	1.9213	2.5986	2.5986
Services to transport; storage	1.0000	1.5291	1.5291	2.2182	2.2182
Communication services	1.0000	1.5021	1.5021	2.1672	2.1672
Banking	1.0000	1.4976	1.4976	2.1752	2.1752
Non-bank finance	1.0000	1.8058	1.8058	2.3785	2.3785
Insurance	1.0000	1.4998	1.4998	2.3075	2.3075
Services to finance, investment and insurance	1.0000	1.0874	1.0874	1.4959	1.4959
Ownership of dwellings	1.0000	1.2263	1.2263	1.3107	1.3107
Other property services	1.0000	2.0261	2.0261	2.8843	2.8843
Scientific research, technical and computer services	1.0000	1.4562	1.4562	2.3419	2.3419
Legal, accounting, marketing & business services	1.0000	1.6619	1.6619	2.5752	2.5752
Other business services	1.0000	1.9198	1.9198	2.6872	2.6872
Government administration	1.0000	1.5918	1.5918	2.7008	2.7008
Defence	1.0000	1.7091	1.7091	2.7555	2.7555
Education	1.0000	1.1684	1.1684	2.4809	2.4809
Health services	1.0000	1.1644	1.1644	2.4116	2.4116
Community services	1.0000	1.7247	1.7247	2.6695	2.6695
Motion picture, radio and television services	1.0000	1.7003	1.7003	2.4091	2.4091
Libraries, museums and the arts	1.0000	1.2847	1.2847	2.2573	2.2573
Sport, gambling and recreational services	1.0000	1.6761	1.6761	2.2785	2.2785
Personal services	1.0000	1.5182	1.5182	2.2242	2.2242
Other services	1.0000	1.2944	1.2944	2.5066	2.5066

Data source: Western Australia 2001-02 Input-Output table.

Note: na = not available.

Western Australian income multipliers

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Sheep	0.0565	0.1468	2.5988	0.2046	3.6236
Grains	0.0530	0.1135	2.1411	0.1583	2.9854
Beef cattle	0.0833	0.1986	2.3839	0.2769	3.3239
Dairy cattle	0.0540	0.2258	4.1858	0.3149	5.8364
Pigs	0.0954	0.2352	2.4657	0.3280	3.4381
Poultry	0.0930	0.2364	2.5430	0.3297	3.5459
Other agriculture	0.1090	0.2101	1.9277	0.2930	2.6879
Services to agriculture; hunting and trapping	0.2645	0.3357	1.2688	0.4680	1.7691
Forestry and logging	0.2135	0.3898	1.8259	0.5435	2.5459
Commercial fishing	0.0984	0.2088	2.1213	0.2912	2.9579
Coal	0.1831	0.3322	1.8145	0.4632	2.5300
Oil & gas	0.0473	0.1003	2.1211	0.1399	2.9575
Iron ores	0.1104	0.1825	1.6531	0.2545	2.3050
Non-ferrous metal ores	0.1103	0.2097	1.9011	0.2924	2.6508
Other mining	0.0893	0.2072	2.3202	0.2889	3.2352
Services to mining	0.1840	0.2958	1.6079	0.4124	2.2420
Meat and meat products	0.1398	0.3097	2.2159	0.4319	3.0897
Dairy products	0.0935	0.2473	2.6440	0.3449	3.6866
Fruit and vegetable products	0.1260	0.3571	2.8335	0.4979	3.9509
Oils and fats	0.0975	0.2517	2.5813	0.3509	3.5992
Flour mill products and cereal foods	0.0999	0.2898	2.9005	0.4041	4.0444
Bakery products	0.2330	0.4277	1.8359	0.5964	2.5599
Confectionery	0.2075	0.4152	2.0008	0.5789	2.7899
Other food products	0.1228	0.3054	2.4874	0.4259	3.4683
Soft drinks, cordials and syrups	0.1032	0.3562	3.4523	0.4967	4.8138
Beer and malt	0.0717	0.2356	3.2879	0.3286	4.5845
Wine and spirits	0.0885	0.2176	2.4595	0.3033	3.4294
Textile fibres, yarns and woven fabrics	0.1603	0.3127	1.9509	0.4360	2.7203
Textile products	0.2032	0.3847	1.8929	0.5364	2.6394
Knitting mill products	0.2143	0.4008	1.8699	0.5588	2.6074
Clothing	0.2029	0.3217	1.5859	0.4486	2.2113
Footwear	0.2694	0.3623	1.3449	0.5051	1.8753
Leather and leather products	0.1232	0.3409	2.7663	0.4753	3.8572
Sawmill products	0.1838	0.3680	2.0022	0.5131	2.7918
Other wood products	0.2225	0.4381	1.9693	0.6109	2.7459
Pulp, paper and paperboard	0.1395	0.3197	2.2925	0.4458	3.1965
Paper containers and products	0.1716	0.3238	1.8871	0.4515	2.6313
Printing and services to printing	0.2253	0.4131	1.8339	0.5760	2.5571
Publishing; recorded media and publishing	0.2192	0.4175	1.9051	0.5822	2.6564
Petroleum and coal products	0.0264	0.0899	3.4000	0.1254	4.7409
Basic chemicals	0.1129	0.2531	2.2428	0.3530	3.1273
Paints	0.1440	0.2997	2.0806	0.4179	2.9011
Medicinal and pharmaceutical products, pesticides	0.1139	0.3180	2.7913	0.4435	3.8921
Soap and detergents	0.1245	0.3283	2.6360	0.4577	3.6756
Cosmetics and toiletry preparations	0.1575	0.3619	2.2970	0.5046	3.2028
Other chemical products	0.1377	0.3251	2.3609	0.4534	3.2919
Rubber products	0.2111	0.3898	1.8462	0.5435	2.5743
Plastic products	0.1868	0.3620	1.9380	0.5047	2.7022
Glass and glass products	0.2192	0.3914	1.7853	0.5457	2.4893
Ceramic products	0.2273	0.3770	1.6583	0.5256	2.3123
Cement, lime and concrete slurry	0.1021	0.3424	3.3526	0.4774	4.6747
Plaster and other concrete products	0.1814	0.3858	2.1262	0.5379	2.9647
Other non-metallic mineral products	0.1937	0.3902	2.0149	0.5441	2.8095
Iron and steel	0.1455	0.3567	2.4508	0.4973	3.4173
Basic non-ferrous metal and products	0.0853	0.2357	2.7617	0.3286	3.8508
Structural metal products	0.2081	0.4177	2.0071	0.5825	2.7986
Sheet metal products	0.2025	0.4359	2.1523	0.6077	3.0011
Fabricated metal products	0.2623	0.4677	1.7831	0.6521	2.4863
Motor vehicles and parts; other transport equipment	0.1357	0.2994	2.2062	0.4174	3.0762

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Ships and boats	0.1822	0.3110	1.7069	0.4337	2.3801
Railway equipment	0.2384	0.4455	1.8687	0.6211	2.6057
Aircraft	0.4548	0.5085	1.1180	0.7090	1.5589
Photographic and scientific equipment	0.2708	0.4725	1.7446	0.6589	2.4326
Electronic equipment	0.1885	0.2967	1.5742	0.4137	2.1950
Household appliances	0.1328	0.3625	2.7284	0.5054	3.8044
Other electrical equipment	0.2129	0.4048	1.9011	0.5644	2.6508
Agricultural, mining and c	0.2154	0.3943	1.8302	0.5498	2.5519
Other machinery and equipment	0.2658	0.4534	1.7060	0.6322	2.3788
Prefabricated buildings	0.1431	0.2640	1.8443	0.3681	2.5716
Furniture	0.2439	0.4183	1.7152	0.5832	2.3916
Other manufacturing	0.2218	0.3962	1.7861	0.5524	2.4905
Electricity supply	0.1005	0.2351	2.3381	0.3278	3.2602
Gas supply	0.1744	0.2776	1.5912	0.3870	2.2187
Water supply; sewerage and drainage services	0.1093	0.2283	2.0895	0.3183	2.9135
Residential building	0.0987	0.2759	2.7950	0.3848	3.8972
Other construction	0.2437	0.3949	1.6203	0.5506	2.2593
Wholesale trade	0.3187	0.5368	1.6844	0.7485	2.3487
Retail trade	0.3589	0.5419	1.5100	0.7556	2.1055
Mechanical repairs	0.2174	0.3381	1.5551	0.4714	2.1683
Other repairs	0.2658	0.3475	1.3075	0.4845	1.8232
Accommodation, cafes and restaurants	0.2335	0.4295	1.8396	0.5989	2.5650
Road transport	0.2122	0.4002	1.8853	0.5580	2.6288
Rail, pipeline and other transport	0.3865	0.5813	1.5039	0.8106	2.0970
Water transport	0.1042	0.2714	2.6046	0.3785	3.6317
Air and space transport	0.2321	0.4023	1.7333	0.5610	2.4168
Services to transport; storage	0.2701	0.4093	1.5153	0.5707	2.1128
Communication services	0.2702	0.3951	1.4620	0.5509	2.0386
Banking	0.2801	0.4025	1.4371	0.5612	2.0038
Non-bank finance	0.1395	0.3402	2.4385	0.4744	3.4002
Insurance	0.3520	0.4798	1.3631	0.6690	1.9006
Services to finance, investment and insurance	0.2183	0.2427	1.1115	0.3384	1.5499
Ownership of dwellings	0.0000	0.0502	na	0.0700	na
Other property services	0.2454	0.5098	2.0776	0.7109	2.8970
Scientific research, technical and computer services	0.3985	0.5261	1.3203	0.7336	1.8410
Legal, accounting, marketing & business services	0.3684	0.5425	1.4728	0.7565	2.0536
Other business services	0.2176	0.4558	2.0948	0.6356	2.9210
Government administration	0.4843	0.6588	1.3603	0.9186	1.8967
Defence	0.4572	0.6216	1.3596	0.8667	1.8957
Education	0.7352	0.7797	1.0604	1.0871	1.4786
Health services	0.6925	0.7409	1.0698	1.0330	1.4917
Community services	0.3821	0.5613	1.4688	0.7826	2.0480
Motion picture, radio and television services	0.2460	0.4211	1.7116	0.5871	2.3866
Libraries, museums and the arts	0.5021	0.5778	1.1507	0.8056	1.6045
Sport, gambling and recreational services	0.1891	0.3578	1.8927	0.4990	2.6391
Personal services	0.2846	0.4194	1.4735	0.5847	2.0546
Other services	0.6456	0.7201	1.1155	1.0041	1.5554

Data source: Western Australia 2001-02 Input-Output table.

Note: na = not available.

Western Australian value added multipliers

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Sheep	0.6475	0.8378	1.2937	0.9694	1.4970
Grains	0.7030	0.8955	1.2739	0.9973	1.4188
Beef cattle	0.6116	0.8569	1.4010	1.0350	1.6922
Dairy cattle	0.4638	0.8501	1.8328	1.0527	2.2696
Pigs	0.5218	0.8318	1.5940	1.0428	1.9983
Poultry	0.5163	0.8557	1.6574	1.0678	2.0681
Other agriculture	0.6718	0.8868	1.3201	1.0753	1.6006
Services to agriculture; hunting and trapping	0.4274	0.6319	1.4784	0.9330	2.1827
Forestry and logging	0.3939	0.7430	1.8865	1.0927	2.7742
Commercial fishing	0.4090	0.6333	1.5486	0.8206	2.0066
Coal	0.5698	0.8471	1.4865	1.1450	2.0094
Oil & gas	0.7435	0.8683	1.1679	0.9583	1.2889
Iron ores	0.5589	0.7220	1.2919	0.8857	1.5848
Non-ferrous metal ores	0.4648	0.6904	1.4853	0.8785	1.8900
Other mining	0.5159	0.7547	1.4629	0.9406	1.8231
Services to mining	0.3951	0.6191	1.5671	0.8844	2.2386
Meat and meat products	0.1861	0.6939	3.7290	0.9717	5.2219
Dairy products	0.2144	0.5870	2.7384	0.8088	3.7733
Fruit and vegetable products	0.2768	0.7961	2.8762	1.1164	4.0333
Oils and fats	0.1924	0.6091	3.1665	0.8348	4.3401
Flour mill products and cereal foods	0.2761	0.8692	3.1478	1.1292	4.0890
Bakery products	0.3718	0.7936	2.1348	1.1772	3.1667
Confectionery	0.3412	0.7546	2.2115	1.1270	3.3029
Other food products	0.2298	0.6805	2.9618	0.9545	4.1540
Soft drinks, cordials and syrups	0.2172	0.7030	3.2375	1.0225	4.7087
Beer and malt	0.3449	0.8431	2.4443	1.0544	3.0571
Wine and spirits	0.3489	0.6561	1.8807	0.8513	2.4400
Textile fibres, yarns and woven fabrics	0.2671	0.7871	2.9474	1.0676	3.9976
Textile products	0.3090	0.6504	2.1048	0.9954	3.2214
Knitting mill products	0.3274	0.6581	2.0102	1.0176	3.1081
Clothing	0.2838	0.5024	1.7701	0.7909	2.7868
Footwear	0.3517	0.5137	1.4603	0.8386	2.3840
Leather and leather products	0.1584	0.6185	3.9051	0.9242	5.8355
Sawmill products	0.4060	0.7689	1.8938	1.0989	2.7067
Other wood products	0.3471	0.7486	2.1567	1.1416	3.2887
Pulp, paper and paperboard	0.3403	0.7132	2.0960	0.9999	2.9388
Paper containers and products	0.3284	0.6190	1.8851	0.9094	2.7695
Printing and services to printing	0.3792	0.7337	1.9351	1.1043	2.9123
Publishing;recorded media and publishing	0.4376	0.7992	1.8263	1.1737	2.6821
Petroleum and coal products	0.1149	0.4969	4.3256	0.5775	5.0278
Basic chemicals	0.2536	0.5825	2.2965	0.8095	3.1917
Paints	0.3450	0.6350	1.8405	0.9038	2.6196
Medicinal and pharmaceutical products, pesticides	0.2419	0.6184	2.5562	0.9036	3.7354
Soap and detergents	0.2463	0.6422	2.6071	0.9366	3.8023
Cosmetics and toiletry preparations	0.2562	0.6405	2.5001	0.9651	3.7671
Other chemical products	0.2879	0.6552	2.2761	0.9469	3.2891
Rubber products	0.3642	0.6898	1.8938	1.0394	2.8537
Plastic products	0.3420	0.6851	2.0035	1.0098	2.9528
Glass and glass products	0.3796	0.7409	1.9520	1.0919	2.8768
Ceramic products	0.4486	0.7806	1.7401	1.1188	2.4937
Cement, lime and concrete slurry	0.2602	0.8043	3.0914	1.1114	4.2716
Plaster and other concrete products	0.3716	0.7942	2.1375	1.1403	3.0687
Other non-metallic mineral products	0.3481	0.7793	2.2386	1.1293	3.2441
Iron and steel	0.2820	0.7599	2.6948	1.0798	3.8293
Basic non-ferrous metal and products	0.2208	0.6154	2.7867	0.8268	3.7440
Structural metal products	0.3175	0.7149	2.2514	1.0895	3.4314
Sheet metal products	0.3307	0.7852	2.3743	1.1761	3.5565
Fabricated metal products	0.3864	0.7790	2.0161	1.1985	3.1016

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Motor vehicles and parts; other transport equipment	0.2849	0.5947	2.0873	0.8632	3.0297
Ships and boats	0.2891	0.5223	1.8064	0.8012	2.7712
Railway equipment	0.3139	0.6521	2.0770	1.0516	3.3497
Aircraft	0.4678	0.5677	1.2134	1.0238	2.1883
Photographic and scientific equipment	0.4155	0.7797	1.8764	1.2035	2.8963
Electronic equipment	0.3680	0.5730	1.5573	0.8391	2.2805
Household appliances	0.2009	0.6203	3.0884	0.9454	4.7071
Other electrical equipment	0.3275	0.6948	2.1216	1.0578	3.2302
Agricultural, mining and c	0.2828	0.6101	2.1572	0.9638	3.4074
Other machinery and equipment	0.3786	0.7257	1.9167	1.1324	2.9908
Prefabricated buildings	0.3440	0.5683	1.6521	0.8050	2.3404
Furniture	0.3484	0.6642	1.9067	1.0394	2.9835
Other manufacturing	0.3918	0.7234	1.8462	1.0787	2.7530
Electricity supply	0.4474	0.8555	1.9121	1.0663	2.3833
Gas supply	0.5555	0.7873	1.4174	1.0362	1.8656
Water supply; sewerage and drainage services	0.5540	0.8232	1.4861	1.0280	1.8557
Residential building	0.3735	0.6987	1.8707	0.9462	2.5333
Other construction	0.4314	0.7085	1.6424	1.0627	2.4635
Wholesale trade	0.4397	0.8407	1.9119	1.3221	3.0068
Retail trade	0.4331	0.7789	1.7984	1.2650	2.9206
Mechanical repairs	0.5512	0.7569	1.3732	1.0601	1.9233
Other repairs	0.6662	0.8206	1.2318	1.1323	1.6996
Accommodation, cafes and restaurants	0.3814	0.7788	2.0421	1.1641	3.0522
Road transport	0.4288	0.7884	1.8387	1.1473	2.6757
Rail, pipeline and other transport	0.4976	0.8491	1.7065	1.3705	2.7544
Water transport	0.2524	0.5941	2.3540	0.8375	3.3186
Air and space transport	0.3637	0.7418	2.0394	1.1027	3.0315
Services to transport; storage	0.6181	0.8762	1.4176	1.2433	2.0116
Communication services	0.6332	0.8649	1.3660	1.2192	1.9256
Banking	0.6178	0.9396	1.5209	1.3006	2.1053
Non-bank finance	0.3953	0.9248	2.3398	1.2300	3.1118
Insurance	0.5617	0.9361	1.6667	1.3664	2.4329
Services to finance, investment and insurance	0.9419	0.9922	1.0533	1.2098	1.2844
Ownership of dwellings	0.8470	0.9512	1.1231	0.9962	1.1762
Other property services	0.3788	0.8428	2.2252	1.3001	3.4324
Scientific research, technical and computer services	0.6110	0.8394	1.3739	1.3113	2.1462
Legal, accounting, marketing & business services	0.5651	0.8920	1.5786	1.3786	2.4397
Other business services	0.3454	0.7847	2.2721	1.1936	3.4559
Government administration	0.5695	0.8786	1.5427	1.4694	2.5802
Defence	0.5184	0.8151	1.5724	1.3726	2.6479
Education	0.8548	0.9385	1.0979	1.6378	1.9160
Health services	0.8608	0.9441	1.0968	1.6086	1.8688
Community services	0.4575	0.7986	1.7457	1.3020	2.8461
Motion picture, radio and television services	0.5165	0.8580	1.6614	1.2357	2.3926
Libraries, museums and the arts	0.7154	0.8539	1.1935	1.3721	1.9179
Sport, gambling and recreational services	0.4772	0.7992	1.6747	1.1201	2.3473
Personal services	0.5803	0.8286	1.4278	1.2047	2.0760
Other services	0.7728	0.9130	1.1814	1.5589	2.0172

Data source: Western Australia 2001-02 Input-Output table.

Note: na = not available.

Western Australian employment multipliers

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Sheep	0.0086	0.0105	1.2256	0.0122	1.4221
Grains	0.0015	0.0027	1.8233	0.0040	2.6988
Beef cattle	0.0229	0.0255	1.1132	0.0278	1.2131
Dairy cattle	0.0093	0.0131	1.4054	0.0157	1.6846
Pigs	0.0047	0.0075	1.6109	0.0102	2.1899
Poultry	0.0048	0.0078	1.6177	0.0105	2.1822
Other agriculture	0.0123	0.0145	1.1815	0.0170	1.3780
Services to agriculture; hunting and trapping	0.0054	0.0082	1.5223	0.0121	2.2355
Forestry and logging	0.0090	0.0133	1.4864	0.0178	1.9874
Commercial fishing	0.0027	0.0050	1.8262	0.0074	2.7072
Coal	0.0038	0.0070	1.8467	0.0108	2.8571
Oil & gas	0.0002	0.0013	5.5239	0.0025	10.3873
Iron ores	0.0010	0.0022	2.3012	0.0043	4.4588
Non-ferrous metal ores	0.0020	0.0039	1.9443	0.0063	3.1553
Other mining	0.0018	0.0041	2.2688	0.0065	3.5885
Services to mining	0.0034	0.0059	1.7076	0.0093	2.7002
Meat and meat products	0.0022	0.0104	4.6873	0.0140	6.2913
Dairy products	0.0020	0.0068	3.3890	0.0096	4.8168
Fruit and vegetable products	0.0024	0.0088	3.6317	0.0129	5.3364
Oils and fats	0.0007	0.0038	5.5526	0.0067	9.7490
Flour mill products and cereal foods	0.0019	0.0058	2.9949	0.0092	4.7063
Bakery products	0.0083	0.0127	1.5347	0.0177	2.1275
Confectionery	0.0256	0.0304	1.1902	0.0352	1.3770
Other food products	0.0012	0.0055	4.5885	0.0090	7.5402
Soft drinks, cordials and syrups	0.0021	0.0086	4.0972	0.0127	6.0589
Beer and malt	0.0015	0.0053	3.5536	0.0081	5.3589
Wine and spirits	0.0038	0.0076	2.0161	0.0101	2.6771
Textile fibres, yarns and woven fabrics	0.0026	0.0089	3.4635	0.0125	4.8638
Textile products	0.0138	0.0179	1.2956	0.0223	1.6159
Knitting mill products	0.0054	0.0096	1.7579	0.0142	2.6063
Clothing	0.0219	0.0247	1.1306	0.0284	1.3001
Footwear	0.0091	0.0114	1.2503	0.0155	1.7091
Leather and leather products	0.0045	0.0106	2.3540	0.0145	3.2251
Sawmill products	0.0051	0.0096	1.8924	0.0139	2.7250
Other wood products	0.0081	0.0131	1.6280	0.0182	2.2530
Pulp, paper and paperboard	0.0023	0.0064	2.8026	0.0101	4.4165
Paper containers and products	0.0024	0.0055	2.3542	0.0093	3.9394
Printing and services to printing	0.0104	0.0145	1.4046	0.0193	1.8640
Publishing; recorded media and publishing	0.0074	0.0121	1.6262	0.0169	2.2734
Petroleum and coal products	0.0003	0.0013	4.6891	0.0023	8.4814
Basic chemicals	0.0013	0.0039	3.1205	0.0068	5.4356
Paints	0.0058	0.0089	1.5403	0.0124	2.1356
Medicinal and pharmaceutical products, pesticides	0.0025	0.0073	2.8976	0.0109	4.3606
Soap and detergents	0.0062	0.0107	1.7242	0.0145	2.3310
Cosmetics and toiletry preparations	0.0052	0.0097	1.8664	0.0139	2.6655
Other chemical products	0.0028	0.0067	2.4130	0.0104	3.7646
Rubber products	0.0050	0.0092	1.8286	0.0137	2.7213
Plastic products	0.0052	0.0088	1.6888	0.0130	2.4862
Glass and glass products	0.0087	0.0126	1.4470	0.0171	1.9643
Ceramic products	0.0048	0.0081	1.6745	0.0124	2.5754
Cement, lime and concrete slurry	0.0016	0.0062	3.8963	0.0101	6.3814
Plaster and other concrete products	0.0037	0.0080	2.1749	0.0124	3.3883
Other non-metallic mineral products	0.0076	0.0117	1.5316	0.0162	2.1207
Iron and steel	0.0043	0.0084	1.9694	0.0125	2.9311
Basic non-ferrous metal and products	0.0018	0.0045	2.5254	0.0072	4.0611
Structural metal products	0.0043	0.0091	2.1116	0.0139	3.2295
Sheet metal products	0.0047	0.0099	2.1253	0.0149	3.2011

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Fabricated metal products	0.0100	0.0147	1.4706	0.0201	2.0093
Motor vehicles and parts; other transport equipment	0.0027	0.0063	2.3248	0.0097	3.6039
Ships and boats	0.0063	0.0093	1.4651	0.0129	2.0292
Railway equipment	0.0035	0.0075	2.1685	0.0127	3.6440
Aircraft	0.0128	0.0140	1.0948	0.0198	1.5538
Photographic and scientific equipment	0.0184	0.0231	1.2572	0.0285	1.5533
Electronic equipment	0.0081	0.0107	1.3089	0.0141	1.7286
Household appliances	0.0049	0.0102	2.0929	0.0144	2.9508
Other electrical equipment	0.0082	0.0127	1.5392	0.0173	2.1054
Agricultural, mining and c	0.0058	0.0098	1.6696	0.0143	2.4468
Other machinery and equipment	0.0077	0.0119	1.5527	0.0172	2.2311
Prefabricated buildings	0.0032	0.0060	1.8460	0.0090	2.7841
Furniture	0.0093	0.0134	1.4389	0.0182	1.9569
Other manufacturing	0.0111	0.0151	1.3585	0.0197	1.7677
Electricity supply	0.0014	0.0038	2.7858	0.0065	4.7494
Gas supply	0.0015	0.0035	2.4005	0.0067	4.5896
Water supply; sewerage and drainage services	0.0039	0.0065	1.6716	0.0091	2.3483
Residential building	0.0077	0.0114	1.4848	0.0146	1.8978
Other construction	0.0044	0.0075	1.7122	0.0121	2.7457
Wholesale trade	0.0055	0.0098	1.7988	0.0160	2.9318
Retail trade	0.0166	0.0206	1.2419	0.0269	1.6173
Mechanical repairs	0.0075	0.0098	1.3114	0.0137	1.8301
Other repairs	0.0018	0.0035	1.9555	0.0075	4.2102
Accommodation, cafes and restaurants	0.0110	0.0152	1.3834	0.0202	1.8320
Road transport	0.0045	0.0083	1.8589	0.0129	2.8899
Rail, pipeline and other transport	0.0034	0.0071	2.0771	0.0138	4.0443
Water transport	0.0022	0.0055	2.5280	0.0086	3.9699
Air and space transport	0.0022	0.0052	2.3927	0.0098	4.5251
Services to transport; storage	0.0036	0.0064	1.7901	0.0111	3.1098
Communication services	0.0044	0.0070	1.5752	0.0115	2.6014
Banking	0.0051	0.0078	1.5132	0.0124	2.4132
Non-bank finance	0.0031	0.0075	2.4186	0.0114	3.6876
Insurance	0.0041	0.0067	1.6309	0.0123	2.9696
Services to finance, investment and insurance	0.0047	0.0052	1.1114	0.0080	1.7109
Ownership of dwellings	0.0000	0.0011	na	0.0017	na
Other property services	0.0022	0.0069	3.1757	0.0128	5.8714
Scientific research, technical and computer services	0.0078	0.0107	1.3612	0.0167	2.1330
Legal, accounting, marketing & business services	0.0078	0.0117	1.5095	0.0180	2.3134
Other business services	0.0092	0.0141	1.5380	0.0194	2.1097
Government administration	0.0080	0.0117	1.4550	0.0192	2.4019
Defence	0.0071	0.0110	1.5507	0.0182	2.5560
Education	0.0173	0.0183	1.0568	0.0272	1.5763
Health services	0.0145	0.0157	1.0806	0.0242	1.6683
Community services	0.0220	0.0262	1.1915	0.0326	1.4856
Motion picture, radio and television services	0.0067	0.0111	1.6578	0.0159	2.3823
Libraries, museums and the arts	0.0135	0.0153	1.1323	0.0219	1.6247
Sport, gambling and recreational services	0.0081	0.0121	1.4932	0.0162	2.0034
Personal services	0.0222	0.0254	1.1424	0.0302	1.3600
Other services	0.0111	0.0128	1.1566	0.0211	1.9033

Data source: Western Australia 2001-02 Input-Output table.

Note: na = not available.

Pilbara output multipliers

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Sheep	1.0000	1.3552	1.3552	1.4224	1.4224
Grains	1.0000	1.3430	1.3430	1.3856	1.3856
Beef cattle	1.0000	1.1296	1.1296	1.1978	1.1978
Other agriculture	1.0000	1.4006	1.4006	1.5158	1.5158
Services to agriculture; hunting and trapping	1.0000	1.1702	1.1702	1.3800	1.3800
Commercial fishing	1.0000	1.3159	1.3159	1.4366	1.4366
Oil & gas	1.0000	1.0504	1.0504	1.0832	1.0832
Iron ores	1.0000	1.0475	1.0475	1.1397	1.1397
Non-ferrous metal ores	1.0000	1.3855	1.3855	1.4816	1.4816
Other mining	1.0000	1.0599	1.0599	1.1418	1.1418
Services to mining	1.0000	1.2493	1.2493	1.3752	1.3752
Meat and meat products	1.0000	1.5492	1.5492	1.6297	1.6297
Dairy products	1.0000	1.4535	1.4535	1.5212	1.5212
Bakery products	1.0000	1.5840	1.5840	1.7830	1.7830
Other food products	1.0000	1.5910	1.5910	1.6994	1.6994
Clothing	1.0000	1.2920	1.2920	1.5526	1.5526
Other wood products	1.0000	1.6814	1.6814	2.0314	2.0314
Printing and services to printing	1.0000	1.5506	1.5506	1.7955	1.7955
Publishing; recorded media and publishing	1.0000	1.5606	1.5606	1.8516	1.8516
Petroleum and coal products	1.0000	1.4863	1.4863	1.5334	1.5334
Basic chemicals	1.0000	1.6398	1.6398	1.8161	1.8161
Paints	1.0000	1.5103	1.5103	1.7424	1.7424
Other chemical products	1.0000	1.4592	1.4592	1.6645	1.6645
Rubber products	1.0000	1.4367	1.4367	1.7211	1.7211
Plastic products	1.0000	1.7314	1.7314	1.8876	1.8876
Glass and glass products	1.0000	1.6260	1.6260	1.9450	1.9450
Cement, lime and concrete slurry	1.0000	1.8592	1.8592	2.0582	2.0582
Plaster and other concrete	1.0000	1.4944	1.4944	1.7301	1.7301
Other non-metallic mineral	1.0000	1.7571	1.7571	2.0689	2.0689
Iron and steel	1.0000	1.5631	1.5631	1.7539	1.7539
Basic non-ferrous metal and	1.0000	1.8914	1.8914	2.0192	2.0192
Structural metal products	1.0000	1.7418	1.7418	2.0707	2.0707
Sheet metal products	1.0000	1.8688	1.8688	2.2073	2.2073
Fabricated metal products	1.0000	1.5307	1.5307	1.8310	1.8310
Motor vehicles and parts; other transport equipment	1.0000	1.6644	1.6644	1.8807	1.8807
Ships and boats	1.0000	1.4201	1.4201	1.6249	1.6249
Railway equipment	1.0000	1.4546	1.4546	1.7479	1.7479
Aircraft	1.0000	1.1689	1.1689	1.3100	1.3100
Electronic equipment	1.0000	1.3957	1.3957	1.5377	1.5377
Household appliances	1.0000	1.7905	1.7905	2.0604	2.0604
Other electrical equipment	1.0000	1.6126	1.6126	1.8861	1.8861
Agricultural, mining and c	1.0000	1.5133	1.5133	1.7693	1.7693
Other machinery and equipment	1.0000	1.6224	1.6224	1.9669	1.9669
Prefabricated buildings	1.0000	1.4061	1.4061	1.5498	1.5498
Furniture	1.0000	1.5890	1.5890	1.8975	1.8975
Other manufacturing	1.0000	1.6331	1.6331	1.9572	1.9572
Electricity supply	1.0000	1.8236	1.8236	1.9215	1.9215
Gas supply	1.0000	1.1982	1.1982	1.3517	1.3517
Water supply; sewerage and drainage services	1.0000	1.3305	1.3305	1.4744	1.4744
Residential building	1.0000	1.4979	1.4979	1.6636	1.6636
Other construction	1.0000	1.3153	1.3153	1.5486	1.5486

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Wholesale trade	1.0000	1.5982	1.5982	1.9905	1.9905
Retail trade	1.0000	1.4853	1.4853	1.9108	1.9108
Mechanical repairs	1.0000	1.3502	1.3502	1.6108	1.6108
Other repairs	1.0000	1.2489	1.2489	1.5507	1.5507
Accommodation, cafes and restaurants	1.0000	1.4419	1.4419	1.7086	1.7086
Road transport	1.0000	1.6201	1.6201	1.9306	1.9306
Rail, pipeline and other transport	1.0000	1.6316	1.6316	2.0135	2.0135
Water transport	1.0000	1.3178	1.3178	1.4305	1.4305
Air and space transport	1.0000	1.6182	1.6182	1.8638	1.8638
Services to transport ;storage	1.0000	1.2982	1.2982	1.5790	1.5790
Communication services	1.0000	1.3888	1.3888	1.7096	1.7096
Banking	1.0000	1.2487	1.2487	1.5538	1.5538
Non-bank finance	1.0000	1.4392	1.4392	1.6702	1.6702
Insurance	1.0000	1.3110	1.3110	1.6442	1.6442
Services to finance, investment and insurance	1.0000	1.0779	1.0779	1.3048	1.3048
Ownership of dwellings	1.0000	1.1529	1.1529	1.1800	1.1800
Other property services	1.0000	1.7905	1.7905	2.1776	2.1776
Scientific research, technical and computer services	1.0000	1.3350	1.3350	1.6624	1.6624
Legal, accounting, marketing and business services	1.0000	1.5545	1.5545	1.9648	1.9648
Other business services	1.0000	1.5598	1.5598	1.8562	1.8562
Government administration	1.0000	1.3677	1.3677	1.9089	1.9089
Defence	1.0000	1.5580	1.5580	2.0469	2.0469
Education	1.0000	1.1113	1.1113	1.8135	1.8135
Health services	1.0000	1.1268	1.1268	1.7559	1.7559
Community services	1.0000	1.5224	1.5224	1.9858	1.9858
Motion picture, radio and television services	1.0000	1.5447	1.5447	1.8684	1.8684
Libraries, museums and the arts	1.0000	1.2008	1.2008	1.6998	1.6998
Sport, gambling and recreational services	1.0000	1.5635	1.5635	1.8361	1.8361
Personal services	1.0000	1.3474	1.3474	1.6824	1.6824
Other services	1.0000	1.1694	1.1694	1.7965	1.7965
Pilbara Iron	1.0000	1.0265	1.0265	1.0838	1.0838
Dampier Salt	1.0000	1.0594	1.0594	1.1280	1.1280

Data source: Pilbara 2001-02 input output table.

Note: na = not available.

Pilbara income multipliers

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Sheep	0.0565	0.1327	2.3496	0.1478	2.6175
Grains	0.0530	0.1058	1.9956	0.1154	2.1766
Beef cattle	0.0833	0.1131	1.3582	0.1285	1.5424
Other agriculture	0.1090	0.1897	1.7408	0.2157	1.9788
Services to agriculture; hunting and trapping	0.2645	0.2999	1.1338	0.3472	1.3124
Commercial fishing	0.0984	0.1540	1.5644	0.1812	1.8404
Oil & gas	0.0473	0.0536	1.1331	0.0610	1.2894
Iron ores	0.1103	0.1160	1.0518	0.1368	1.2400
Non-ferrous metal ores	0.1103	0.1722	1.5609	0.1938	1.7569
Other mining	0.0883	0.0987	1.1183	0.1172	1.3273
Services to mining	0.1840	0.2298	1.2491	0.2581	1.4033
Meat and meat products	0.1398	0.2368	1.6943	0.2549	1.8240
Dairy products	0.0935	0.1876	2.0059	0.2029	2.1689
Bakery products	0.2330	0.3586	1.5391	0.4034	1.7314
Other food products	0.1228	0.2499	2.0354	0.2743	2.2342
Clothing	0.2029	0.2827	1.3938	0.3414	1.6831
Other wood products	0.2225	0.3829	1.7212	0.4617	2.0755
Printing and services to printing	0.2253	0.3562	1.5812	0.4113	1.8260
Publishing; recorded media and publishing	0.2192	0.3710	1.6929	0.4366	1.9920
Petroleum and coal products	0.0264	0.0612	2.3132	0.0718	2.7138
Basic chemicals	0.1129	0.2183	1.9344	0.2580	2.2862
Paints	0.1440	0.2580	1.7911	0.3103	2.1541
Other chemical products	0.1377	0.2257	1.6389	0.2720	1.9747
Rubber products	0.2111	0.3093	1.4650	0.3733	1.7683
Plastic products	0.1868	0.3329	1.7825	0.3681	1.9708
Glass and glass products	0.2192	0.3503	1.5979	0.4221	1.9256
Cement, lime and concrete slurry	0.1021	0.2689	2.6336	0.3137	3.0723
Plaster and other concrete	0.1814	0.2797	1.5415	0.3328	1.8340
Other non-metallic mineral	0.1937	0.3450	1.7816	0.4152	2.1440
Iron and steel	0.1455	0.2333	1.6031	0.2763	1.8983
Basic non-ferrous metal and	0.0853	0.2045	2.3962	0.2333	2.7333
Structural metal products	0.2081	0.3632	1.7449	0.4372	2.1008
Sheet metal products	0.2025	0.3815	1.8838	0.4577	2.2602
Fabricated metal products	0.2623	0.3699	1.4104	0.4375	1.6682
Motor vehicles and parts; other transport equipment	0.1357	0.2678	1.9737	0.3165	2.3327
Ships and boats	0.1822	0.2743	1.5053	0.3204	1.7584
Railway equipment	0.2384	0.3393	1.4233	0.4053	1.7003
Aircraft	0.4548	0.4940	1.0861	0.5258	1.1560
Electronic equipment	0.1885	0.2789	1.4800	0.3109	1.6497
Household appliances	0.1328	0.3065	2.3073	0.3673	2.7648
Other electrical equipment	0.2129	0.3434	1.6129	0.4050	1.9022
Agricultural, mining and c	0.2154	0.3257	1.5120	0.3834	1.7796
Other machinery and equipment	0.2658	0.3987	1.5001	0.4763	1.7919
Prefabricated buildings	0.1431	0.2318	1.6198	0.2642	1.8458
Furniture	0.2439	0.3830	1.5707	0.4525	1.8556
Other manufacturing	0.2218	0.3629	1.6361	0.4359	1.9652
Electricity supply	0.0386	0.1281	3.3143	0.1501	3.8848
Gas supply	0.1744	0.2084	1.1945	0.2429	1.3926
Water supply; sewerage and drainage services	0.1093	0.1688	1.5454	0.2012	1.8420
Residential building	0.0987	0.2111	2.1388	0.2485	2.5167
Other construction	0.2437	0.3159	1.2962	0.3685	1.5119

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Wholesale trade	0.3187	0.4676	1.4673	0.5559	1.7445
Retail trade	0.3589	0.4800	1.3376	0.5759	1.6046
Mechanical repairs	0.2174	0.3093	1.4230	0.3680	1.6930
Other repairs	0.2658	0.3226	1.2138	0.3905	1.4695
Accommodation, cafes and restaurants	0.2335	0.3315	1.4197	0.3915	1.6769
Road transport	0.2122	0.3575	1.6845	0.4274	2.0139
Rail, pipeline and other transport	0.3865	0.5280	1.3659	0.6140	1.5884
Water transport	0.1042	0.1631	1.5650	0.1884	1.8084
Air and space transport	0.2321	0.3257	1.4029	0.3810	1.6412
Services to transport ;storage	0.2701	0.3442	1.2743	0.4074	1.5084
Communication services	0.2702	0.3665	1.3564	0.4387	1.6236
Banking	0.2801	0.3446	1.2303	0.4133	1.4757
Non-bank finance	0.1395	0.2555	1.8316	0.3075	2.2044
Insurance	0.3520	0.4370	1.2415	0.5120	1.4547
Services to finance, investment and insurance	0.2183	0.2403	1.1005	0.2914	1.3345
Ownership of dwellings	0.0000	0.0318	na	0.0379	na
Other property services	0.2454	0.4423	1.8024	0.5295	2.1577
Scientific research, technical and computer services	0.3985	0.4918	1.2343	0.5656	1.4193
Legal, accounting, marketing & business management services	0.3684	0.5147	1.3972	0.6071	1.6480
Other business services	0.2176	0.3550	1.6313	0.4217	1.9381
Government administration	0.4843	0.5980	1.2347	0.7198	1.4864
Defence	0.4572	0.5848	1.2791	0.6949	1.5199
Education	0.7352	0.7636	1.0386	0.9217	1.2536
Health services	0.6925	0.7308	1.0553	0.8725	1.2599
Community services	0.3821	0.5065	1.3255	0.6108	1.5985
Motion picture, radio and television services	0.2460	0.3830	1.5570	0.4559	1.8533
Libraries, museums and the arts	0.5021	0.5562	1.1077	0.6686	1.3315
Sport, gambling and recreational services	0.1891	0.3306	1.7484	0.3920	2.0731
Personal services	0.2846	0.3731	1.3109	0.4485	1.5760
Other services	0.6456	0.6860	1.0626	0.8272	1.2813
Pilbara Iron	0.0751	0.0810	1.0793	0.0939	1.2514
Dampier Salt	0.0705	0.0846	1.1995	0.1001	1.4185

Data source: Pilbara 2001-02 input output table.

Note: na = not available.

Pilbara value added multipliers

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Sheep	0.6475	0.7995	1.2346	0.8368	1.2922
Grains	0.7030	0.8795	1.2512	0.9032	1.2849
Beef cattle	0.6116	0.6683	1.0927	0.7062	1.1545
Other agriculture	0.6718	0.8397	1.2499	0.9037	1.3452
Services to agriculture; hunting and trapping	0.4274	0.5033	1.1775	0.6198	1.4501
Commercial fishing	0.4090	0.5287	1.2927	0.5957	1.4565
Oil & gas	0.7435	0.7717	1.0379	0.7899	1.0624
Iron ores	0.5592	0.5847	1.0456	0.6359	1.1372
Non-ferrous metal ores	0.4648	0.6158	1.3248	0.6691	1.4395
Other mining	0.5214	0.5456	1.0464	0.5911	1.1336
Services to mining	0.3951	0.4925	1.2465	0.5624	1.4235
Meat and meat products	0.1861	0.4560	2.4504	0.5006	2.6905
Dairy products	0.2144	0.3932	1.8343	0.4308	2.0097
Bakery products	0.3718	0.6095	1.6394	0.7199	1.9366
Other food products	0.2298	0.4763	2.0730	0.5365	2.3350
Clothing	0.2838	0.4170	1.4691	0.5617	1.9790
Other wood products	0.3471	0.6392	1.8415	0.8336	2.4014
Printing and services to printing	0.3792	0.6147	1.6210	0.7506	1.9796
Publishing; recorded media and publishing	0.4376	0.7048	1.6108	0.8665	1.9801
Petroleum and coal products	0.1149	0.4389	3.8205	0.4650	4.0480
Basic chemicals	0.2536	0.5151	2.0309	0.6130	2.4169
Paints	0.3450	0.5534	1.6040	0.6823	1.9776
Other chemical products	0.2879	0.4655	1.6171	0.5796	2.0133
Rubber products	0.3642	0.5420	1.4881	0.6999	1.9215
Plastic products	0.3420	0.6280	1.8364	0.7147	2.0901
Glass and glass products	0.3796	0.6559	1.7280	0.8330	2.1947
Cement, lime and concrete slurry	0.2602	0.6394	2.4577	0.7499	2.8823
Plaster and other concrete	0.3716	0.5715	1.5382	0.7024	1.8904
Other non-metallic mineral	0.3481	0.6652	1.9109	0.8383	2.4081
Iron and steel	0.2820	0.5135	1.8209	0.6194	2.1966
Basic non-ferrous metal and	0.2208	0.5596	2.5343	0.6306	2.8555
Structural metal products	0.3175	0.6063	1.9093	0.7889	2.4845
Sheet metal products	0.3307	0.6749	2.0407	0.8628	2.6091
Fabricated metal products	0.3864	0.5932	1.5352	0.7600	1.9668
Motor vehicles and parts; other transport equipment	0.2849	0.5333	1.8719	0.6535	2.2936
Ships and boats	0.2891	0.4514	1.5614	0.5651	1.9547
Railway equipment	0.3139	0.4646	1.4800	0.6275	1.9987
Aircraft	0.4678	0.5407	1.1558	0.6191	1.3233
Electronic equipment	0.3680	0.5396	1.4665	0.6185	1.6808
Household appliances	0.2009	0.5127	2.5525	0.6626	3.2987
Other electrical equipment	0.3275	0.5685	1.7361	0.7204	2.1999
Agricultural, mining and c	0.2828	0.4846	1.7134	0.6268	2.2159
Other machinery and equipment	0.3786	0.6211	1.6405	0.8124	2.1456
Prefabricated buildings	0.3440	0.5056	1.4698	0.5853	1.7017
Furniture	0.3484	0.5946	1.7066	0.7658	2.1983
Other manufacturing	0.3918	0.6509	1.6611	0.8309	2.1206
Electricity supply	0.1908	0.7115	3.7290	0.7659	4.0139
Gas supply	0.5555	0.6626	1.1929	0.7478	1.3463
Water supply; sewerage and drainage services	0.5540	0.7033	1.2695	0.7832	1.4138
Residential building	0.3735	0.5735	1.5354	0.6655	1.7817
Other construction	0.4314	0.5622	1.3034	0.6918	1.6038

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Wholesale trade	0.4397	0.7119	1.6190	0.9298	2.1145
Retail trade	0.4331	0.6604	1.5247	0.8967	2.0703
Mechanical repairs	0.5512	0.7020	1.2737	0.8467	1.5362
Other repairs	0.6662	0.7735	1.1610	0.9410	1.4125
Accommodation, cafes and restaurants	0.3814	0.5786	1.5172	0.7267	1.9055
Road transport	0.4288	0.7076	1.6502	0.8800	2.0523
Rail, pipeline and other transport	0.4976	0.7477	1.5026	0.9597	1.9288
Water transport	0.2524	0.3828	1.5168	0.4453	1.7646
Air and space transport	0.3637	0.5990	1.6467	0.7353	2.0216
Services to transport ;storage	0.6181	0.7581	1.2265	0.9140	1.4787
Communication services	0.6332	0.8096	1.2787	0.9877	1.5599
Banking	0.6178	0.7435	1.2034	0.9129	1.4777
Non-bank finance	0.3953	0.6202	1.5692	0.7485	1.8937
Insurance	0.5617	0.7709	1.3726	0.9559	1.7020
Services to finance, investment and insurance	0.9419	0.9862	1.0470	1.1122	1.1808
Ownership of dwellings	0.8470	0.9124	1.0772	0.9274	1.0950
Other property services	0.3788	0.7143	1.8857	0.9293	2.4533
Scientific research, technical and computer services	0.6110	0.7765	1.2708	0.9582	1.5683
Legal, accounting, marketing and business management services	0.5651	0.8341	1.4760	1.0619	1.8792
Other business services	0.3454	0.6008	1.7394	0.7653	2.2160
Government administration	0.5695	0.7531	1.3224	1.0536	1.8501
Defence	0.5184	0.7454	1.4379	1.0169	1.9616
Education	0.8548	0.9080	1.0623	1.2979	1.5184
Health services	0.8608	0.9251	1.0748	1.2745	1.4806
Community services	0.4575	0.6949	1.5191	0.9522	2.0816
Motion picture, radio and television services	0.5165	0.7764	1.5034	0.9562	1.8515
Libraries, museums and the arts	0.7154	0.8112	1.1339	1.0883	1.5213
Sport, gambling and recreational services	0.4772	0.7390	1.5487	0.8904	1.8659
Personal services	0.5803	0.7423	1.2792	0.9284	1.5997
Other services	0.7728	0.8496	1.0995	1.1978	1.5501
Pilbara Iron	0.7914	0.8031	1.0147	0.8349	1.0550
Dampier Salt	0.7448	0.7715	1.0358	0.8096	1.0869

Data source: Pilbara 2001-02 input output table.

Note: na = not available.

Pilbara employment multipliers

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Sheep	0.0197	0.0213	1.0812	0.0218	1.1045
Grains	0.0324	0.0370	1.1433	0.0373	1.1523
Beef cattle	0.0063	0.0070	1.1046	0.0075	1.1784
Other agriculture	0.0123	0.0140	1.1399	0.0148	1.2041
Services to agriculture; hunting and trapping	0.0054	0.0063	1.1592	0.0077	1.4247
Commercial fishing	0.0013	0.0024	1.8352	0.0032	2.4685
Oil & gas	0.0000	0.0001	3.7839	0.0004	9.5427
Iron ores	0.0007	0.0007	1.0789	0.0013	2.0385
Non-ferrous metal ores	0.0020	0.0033	1.6356	0.0039	1.9659
Other mining	0.0024	0.0026	1.0845	0.0032	1.3147
Services to mining	0.0034	0.0045	1.3056	0.0053	1.5573
Meat and meat products	0.0022	0.0052	2.3534	0.0058	2.6015
Dairy products	0.0020	0.0039	1.9700	0.0044	2.2027
Bakery products	0.0083	0.0110	1.3273	0.0124	1.4915
Other food products	0.0012	0.0038	3.2290	0.0046	3.8531
Clothing	0.0219	0.0237	1.0838	0.0255	1.1656
Other wood products	0.0081	0.0118	1.4576	0.0142	1.7550
Printing and services to printing	0.0104	0.0133	1.2891	0.0150	1.4513
Publishing; recorded media and publishing	0.0074	0.0110	1.4850	0.0130	1.7537
Petroleum and coal products	0.0003	0.0006	2.2647	0.0009	3.4467
Basic chemicals	0.0013	0.0031	2.4936	0.0043	3.4541
Paints	0.0058	0.0080	1.3808	0.0096	1.6555
Other chemical products	0.0028	0.0046	1.6720	0.0060	2.1805
Rubber products	0.0050	0.0074	1.4758	0.0094	1.8636
Plastic products	0.0052	0.0082	1.5609	0.0092	1.7658
Glass and glass products	0.0087	0.0117	1.3455	0.0139	1.5966
Cement, lime and concrete slurry	0.0016	0.0047	2.9714	0.0061	3.8315
Plaster and other concrete	0.0037	0.0057	1.5693	0.0074	2.0109
Other non-metallic mineral	0.0076	0.0108	1.4116	0.0129	1.6918
Iron and steel	0.0043	0.0061	1.4217	0.0074	1.7281
Basic non-ferrous metal and	0.0018	0.0039	2.2041	0.0048	2.6998
Structural metal products	0.0043	0.0079	1.8367	0.0102	2.3609
Sheet metal products	0.0047	0.0088	1.8859	0.0111	2.3834
Fabricated metal products	0.0100	0.0126	1.2573	0.0146	1.4634
Motor vehicles and parts; other transport equipment	0.0027	0.0056	2.0768	0.0071	2.6273
Ships and boats	0.0063	0.0085	1.3330	0.0099	1.5543
Railway equipment	0.0035	0.0052	1.5009	0.0072	2.0794
Aircraft	0.0128	0.0136	1.0695	0.0146	1.1453
Electronic equipment	0.0081	0.0103	1.2639	0.0113	1.3836
Household appliances	0.0049	0.0090	1.8452	0.0108	2.2256
Other electrical equipment	0.0082	0.0113	1.3763	0.0132	1.6042
Agricultural, mining and c	0.0058	0.0083	1.4264	0.0101	1.7270
Other machinery and equipment	0.0077	0.0108	1.3994	0.0131	1.7063
Prefabricated buildings	0.0032	0.0052	1.6184	0.0062	1.9225
Furniture	0.0093	0.0125	1.3494	0.0147	1.5769
Other manufacturing	0.0111	0.0144	1.2901	0.0166	1.4895
Electricity supply	0.0014	0.0023	1.6959	0.0030	2.1825
Gas supply	0.0015	0.0021	1.4618	0.0032	2.1826
Water supply; sewerage and drainage services	0.0039	0.0052	1.3488	0.0062	1.6029
Residential building	0.0032	0.0054	1.6921	0.0065	2.0477
Other construction	0.0072	0.0086	1.2043	0.0102	1.4278

Sector	Initial effect	Simple multiplier	Type 1 multiplier	Total multiplier	Type 2 multiplier
Wholesale trade	0.0055	0.0083	1.5224	0.0110	2.0157
Retail trade	0.0166	0.0192	1.1535	0.0221	1.3291
Mechanical repairs	0.0075	0.0092	1.2316	0.0110	1.4697
Other repairs	0.0018	0.0029	1.6608	0.0050	2.8270
Accommodation, cafes and restaurants	0.0110	0.0130	1.1810	0.0148	1.3469
Road transport	0.0045	0.0074	1.6524	0.0095	2.1288
Rail, pipeline and other transport	0.0034	0.0061	1.7813	0.0087	2.5510
Water transport	0.0022	0.0033	1.5161	0.0041	1.8725
Air and space transport	0.0022	0.0037	1.6908	0.0054	2.4661
Services to transport ;storage	0.0036	0.0051	1.4283	0.0070	1.9675
Communication services	0.0044	0.0063	1.4235	0.0085	1.9197
Banking	0.0051	0.0065	1.2706	0.0086	1.6770
Non-bank finance	0.0031	0.0056	1.8301	0.0072	2.3433
Insurance	0.0041	0.0058	1.4087	0.0081	1.9624
Services to finance, investment and insurance	0.0047	0.0051	1.1002	0.0067	1.4341
Ownership of dwellings	0.0000	0.0006	na	0.0008	na
Other property services	0.0022	0.0055	2.5364	0.0082	3.7557
Scientific research, technical and computer services	0.0078	0.0099	1.2625	0.0122	1.5485
Legal, accounting, marketing & business services	0.0078	0.0111	1.4294	0.0139	1.7915
Other business services	0.0092	0.0121	1.3145	0.0141	1.5359
Government administration	0.0080	0.0103	1.2904	0.0140	1.7537
Defence	0.0071	0.0105	1.4687	0.0138	1.9396
Education	0.0173	0.0179	1.0351	0.0227	1.3137
Health services	0.0145	0.0154	1.0630	0.0197	1.3603
Community services	0.0220	0.0249	1.1350	0.0281	1.2796
Motion picture, radio and television services	0.0067	0.0101	1.5137	0.0123	1.8455
Libraries, museums and the arts	0.0135	0.0148	1.0944	0.0182	1.3477
Sport, gambling and recreational services	0.0081	0.0114	1.4090	0.0132	1.6405
Personal services	0.0222	0.0243	1.0938	0.0266	1.1973
Other services	0.0111	0.0120	1.0850	0.0163	1.4723
Pilbara Iron	0.0009	0.0011	1.1700	0.0015	1.6003
Dampier Salt	0.0008	0.0012	1.4648	0.0016	2.0580

Data source: Pilbara 2001-02 input output table.

Note: na = not available.

Chapter 6

QMM, the mine of the future

6.1. The mine of the future

Chapters 1 and 2 examined how the old models of regional economic development have frequently relied on large firms providing direct capital and jobs, and have assumed that the new technologies, production systems and managerial skills brought in by these firms would be eventually transferred to local enterprises, thus underpinning long-term regional growth. Outcomes from these models have often been disappointing, and even large industrial complexes have been repeatedly unable to energise the local business environment and to secure the sustainable expansion of regional economies beyond the initial push from one-off capital investments. In the same way, heavy reliance on infrastructure with no emphasis on other development factors has generally failed to increase competitiveness in the long run and has thus been unable to prevent local enterprises from falling behind more dynamic external firms (e.g. Rodríguez-Pose and Arbix 2001). Another problem with these models has been the tendency to replicate the same strategies in regions with markedly different socioeconomic and cultural characteristics (Vazquez Barquero 1990).

Previous chapters have also explored how the increasing rejection of these approaches, together with the escalating challenges faced by sub-national economies due to globalisation, led to the emergence of a group of bottom-up and territory-specific regional development policies over the last twenty years, based on the principles of social participation and dialogue; the mobilisation of local resources; the consolidation of competitive advantages; and the effective support for local ownership and management (Vazquez Barquero 1999). However, and despite the strength of these new ideas, it would be a mistake to interpret this as a linear and undisputed phenomenon by which top-down and centralised policies have been suddenly and extensively abandoned for more pluralistic approaches. Rather, this has been a gradual and at times staggered process where custom-made responses progressively gained ground as the underpinning force of new regional development strategies (Lovering 1999). In mining, for example, an industry commonly enabled by significant flows of foreign direct investment (FDI) with little pre-existent roots in the local economies[81], development efforts associated to major projects have typically remained alien to this new thinking.

The development of QMM (QIT Madagascar Minerals) is among the first cases where there has been an explicit attempt to incorporate some of these new concepts into the designing of a regional development process dominated by the construction of a large mine. QMM is a leading example in a new generation of mining projects that have had to conceive their business activities as driving forces for broader regional development interventions as part of their core strategies for mitigating project risk. As such, this project has been described as a pure representation of the SD model of mineral development (Rio Tinto website). In particular, as a green-field project in early stages of production, QMM provided an unrivalled opportunity to explore the type of preparation work in the socioeconomic arena to be undertaken within this model. It is also a good example of how the logistics around the transportation of a mine's produce to the markets, often a critical challenge for the industry in developing economies, has became here an opportunity to address issues of economic development more broadly.

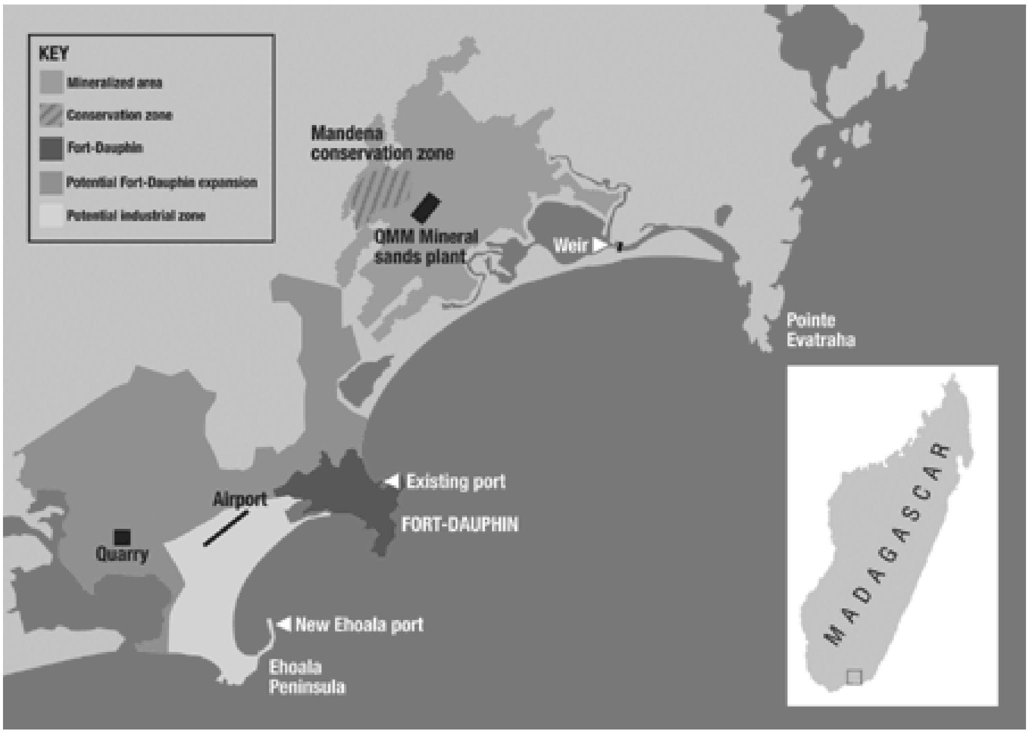
In August 2005, the Rio Tinto's Board approved the development of this large ilmenite[82] project, initially estimated at $580 million[83, 84]. In 2009, as this research was coming to a conclusion, QMM came into production. The mine is located near the town of Fort-Dauphin, in the Anosy region, South-East of Madagascar. Early capacity was planned at 0.75 million tonnes per year (MTY), peaking at 1MTY after a short ramp up period (Rio Tinto 2005). At this rate of production, the life of the deposit was estimated in between forty and sixty years. The mine will also become the main customer of a new multi-user sea harbour near Fort-Dauphin[85], providing a base load business to help establish the export facility (World Bank 2004). Being up until this point the largest single investment in the history of the country, QMM

[81] For more on this see chapter 2.
[82] Illmenite is an industrial mineral used as whitening pigment, for instance, in toothpaste
[83] 80% Rio Tinto ownership and the balance by the government of Madagascar
[84] All monetary values throughout this study are expressed in US dollars of the day unless otherwise stated
[85] The pre-existing improvised and unprotected port was repeatedly blamed for the economic isolation of the region (e.g. QMM 2001)

attracted the attention of the international community from day one. In response, the company claim to have liaised extensively with various regional players, so as to understand and capture its full potential benefits to the economy and to maximise the local content of these benefits (Rio Tinto Economic Department 2004).

Figure 6.1 – Map of Madagascar, the Anosy Region, and the project area

Source: Rio Tinto



It was within this context that former Rio Tinto Chairman, Paul Skinner, described the project as '*A model for further projects which are likely to follow in Africa and the developing world*' (Rio Tinto website). Similarly, Rio Tinto CEO at the time, Leigh Clifford, portrayed it as the '*mine of the future'*, claiming that the company has managed to design an operation that effectively integrates environmental, social and economic aspects. He added:

> *'We have already demonstrated that we are committed to developing the project in a manner consistent with the principles of sustainable development. Indeed, it will be a model of the contribution mining can make through the successful integration of financial, environmental and community objectives'* (Clifford 2004 p1)

In the early hours, and despite the high environmental sensitivity associated to the Anosy region, the project even managed to enthuse many environmental activists, perhaps the most intransigent of the mining critics. For instance, Martin Nicoll of WWF told the English journal The Economist that mining is not necessarily incompatible with preserving the environment, and that in Madagascar, slash-and-burn farming, not mining, was responsible for most of the ecological damage (The Economist, 2007). As such, long-term economic development could actually have a net positive effect on the environment. For Rio Tinto, it soon became apparent that the long term viability of this project was intimately linked to its ability to contribute to orderly regional economic development compatible with the expectations it had created – in addition to delivering strong shareholder value.

Given its early stage, the effect of QMM on the Anosy economy will not be fully visible for several years. Instead, this study undertakes an examination of the rationale underpinning the design process behind this project up to its feasibility stage (FS). It also highlights some early signs of conflict identified during construction, and some perceived strains in the relationship between key stakeholders – some of which had crossed boundaries of responsibility previously assumed out of reach. Thus, a central focus of this analysis is the process of economic planning and the negotiation between Rio Tinto and the government (or the World Bank on its behalf). The next section introduces the economy of Madagascar and the Anosy region, as well as a thorough description of the QMM project. Section three describes the establishment of a broad development framework for the region and a wider attempt to build managerial capacity at the local level. Section four explores the emerging partnership between the company and the World Bank, and the projected benefits for the region from an ambitious regional investment strategy. Section five introduces the view of those directly affected by the project and identifies some early discussion around the problems and virtues of the undertaking up until the end of construction. Final comments take place in section six.

The research methodology was already discussed in chapter 3. As a summary, consistent with previous case studies, the base year for this analysis is 2004. However, as there were no financial results available from the company at the time of writing, instead of actual cash flows, the assessment of economic contributions is based on existing projections discounted at applicable rates. The methodology for these calculations is explained in the text, with all original tables included as appendixes. For local data, the study relies on economic literature on Madagascar and the Anosy region mainly from World Bank, IMF and local sources. As primary sources, the study builds on interviews with relevant Rio Tinto employees, local residents and other regional players, all of which are referenced throughout. As in the previous case studies, all interviews were conducted for the sole purpose of this research and took place in Fort-Dauphine, Johannesburg, or London, between 2007 and 2008.

6.2. Background to the region and project

6.2.1 Madagascar and the Anosy region

Madagascar was a French colony from 1896 until its independence in 1960. After almost two decades under a socialist system, the country moved to a liberal democracy. Its political system is based on autonomous provinces with a central government managed by a prime minister, and a bicameral legislature. Madagascar is one of the poorest countries in the world, with a GDP per capita equivalent to $210 (2004) and 69% of the population below the poverty line. In an effort to attract foreign investment and to underpin growth, the government completed its Poverty Reduction Strategy Paper (Document de Stratégie pour la Réduction de la Pauvreté), or DSRP (2000), setting the target to halve poverty in ten years. This policy strategy paper followed World Bank and IMF policy advice and led to some business-friendly reforms, including the privatisation of some public services. A period of economic growth averaging 4.6% between 1997-2001 increased average living standards nationwide but had a disappointingly low impact on improving conditions for the rural population.

In 2001, a conflictive presidential election led to a six month political crisis. The impact on economic and social conditions was significant, with GDP contracting by 12.7%; foreign investors leaving Madagascar; roads and bridges destroyed throughout the country; and exports coming to a virtual standstill (the Mining Journal 2007). Under the Presidency of Marc Ravalomanana, the economy started to recover from this political upheaval in 2002. Strong economic growth of near 10% in 2003 aided the easing of political tensions, but worries returned with an inflation crisis in 2004. Some key macroeconomic indicators for Madagascar during this period are introduced in Table 6.1. Towards the end of this study, Andry Rajoelina ousted former president Ravalomanana in a bloodless coup in March 2009, and launched a thorough review of mining contracts which, by September that year, had not had included QMM (The Wall Street Journal 2009)

In 2005, the population was near 18 million, divided into 18 ethnic groups sharing a common language, Malagasy. Approximately 80% of the population are engaged in subsistence agriculture, with limited access to transport often blamed as the main obstacle to higher agricultural productivity. Health care and education are extremely precarious throughout the country. Only 54% of the population have access to clean water in urban areas – and 4% in rural areas. Life expectancy is 52 years and the infant mortality rate is as high as 89 deaths per 1000 births. Literacy is estimated at 46% (The World Bank 2006). The country has a unique but rapidly depleting natural environment, cleared extensively for agriculture and harvested by the local population for firewood, charcoal and construction wood. Approximately 85% of the flora and fauna in Madagascar are endemic, though nearly 80% of the original forest has been destroyed and the rest is being cut down or burned at a high rate. Given the number of unique species at risk, environmental organisations refer to the country as a global biodiversity 'hotspot' (for instance, Panos London 2007)

Table 6.1 - Key macroeconomic indicators

Source: World Markets Research Centre

	2001	2002	2003	2004	2005
GDP growth, %	6.0	-12.7	9.8	4.7	5.5
GDP, US$ billion	4.5	4.4	5.5	3.7	3.7
GDP per capita, US$	283	267	324	210	209
Inflation (CPI)	6.9	15.9	-1.2	14.1	7.4
Population, millions	16.0	16.4	16.9	17.3	17.8
Population growth, %	2.9	2.9	2.8	2.7	2.6
Trade balance, US$ billion	-0.3	-0.4	-0.6	-0.7	-0.6
Local currency to US$	6588	6831	6191	10711	11952
Total export earnings, US$ billion	1.2	1.4	0.8	1.2	1.2
Foreign direct investment, US$ million	83	63	11	44	62
Total External Debt, US$ billion	4.7	4.1	5.0	4.8	4.7

Located in the South-East extreme of Madagascar, in the Toliara province, the Anosy region is one of the poorest in Madagascar. Within Anosy's 64 communes the population is estimated at 360,000 people (2000) and projections estimate this will double to 720,000 by 2020. This is expected to increase pressure on the endangered local forest. As elsewhere in Madagascar, the littoral forest remnants are under heavy strain from villagers who depend on it (TZMI 2004). Satellite photos taken of the littoral forest indicate that about 60% of what remained of it in 1950 has disappeared, with the rest bound to disappear over the next 25-40 years at current depleting rates. Income in the region is estimated at US$183 per capita (2004), significantly lower than that of the country as a whole, with 80% of the population below the poverty line. Literacy in the region sits between 25 and 15%. In addition, one quarter of the population suffers from malaria, and 16% from serious respiratory infections – often liked to the widespread use of charcoal (World Markets Research Centre 2005)

Most economic transactions take place in the largest town in Anosy, Fort-Dauphin, which has a population of around 50,000 people. The town has a small airport that accommodates Boeing 737s, but otherwise its infrastructure is very precarious, including a small port and roads in very poor condition. As per sources of income, around 20,000 visitors travel to Fort-Dauphin every year, mainly attracted by the beauty of the Andohaela National Park and some further ecotourism spots, and typically stay for a few days. Occasionally, cruise ships attempt to anchor in the Fort-Dauphin bay, but the unpredictability of the ocean waves and the lack of a large port have all but curtailed this activity. Approximately 6,000 people work in sisal plantations to the west of Fort-Dauphin with about 12,000 tonnes of sisal being exported annually. Lower cost competition has negatively impacted this industry over the past decade. Lobsters, caught by villagers along the coast, are purchased by local businesses and processed for export. High potential has often been attributed to this industry, although growth would require significant improvement in local infrastructure. Other small-scale economic activity in the region includes agriculture, exotic fruit and spices, and the import of food and construction materials for local consumption (QMM 2001).

*Table 6.2 - Government finances**

Source: IMF 2004

2001	billions of francs	millions of US$
Deficit or Surplus	-1,203	-185
Revenue	3,029	466
Grants received	1,003	154
Expenditure	5,182	797
Financing		
Domestic	580	89
Foreign	518	80
Adjustment to total financing	104	16

* The publication of this data was later interrupted and reliable figures on government finance are not easily obtainable. 2001 appears to be a rather typical year, and the ratio 'foreign grants' to 'government revenues' of around 33% is consistent with previous records.

Within a national context of extreme underdevelopment and financial shortfalls, the World Bank has long played a fundamental role in the country's finances, including annual contributions often accounting for more than 1/3 of total government revenues (Table 6.2 illustrates this point based on data for 2001). The Bank has also turned its attention to the real economy. In this regard, despite the recurrent political and economic crises, many commentators have highlighted the significant potential for fast economic growth in Madagascar including: large spare capacity in the textile industry and other firms operating near the capital Antananarivo; an agricultural sector whose productivity is among the lowest in the world; natural beauty and biodiversity that presents a large potential for tourism; and rich (though unexploited) mining potential that has so far concentrated in the informal sector, with precious stones smuggled into the world market with little benefit to Madagascar (QMM 2001, TZMI 2004, MAP 2006). To take advantage of the country's potential, and in support of Madagascar's PRSP, the World Bank proposed a new Country Assistance Strategy (CAS) towards the end of 2003.

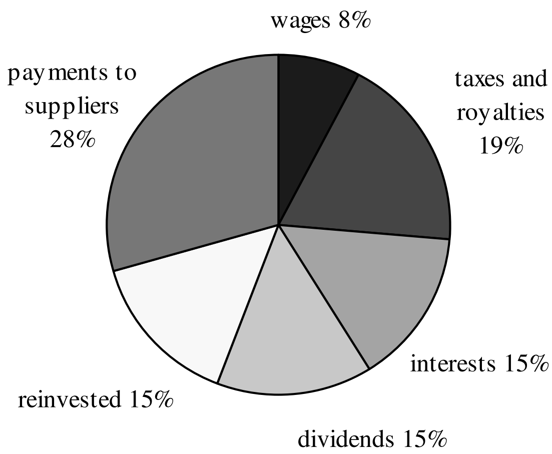
Underpinned by a lending program of US$500 million over 3 years, the Bank's strategy consisted in establishing an Integrated Growth Poles plan (Pôles Intègres de Croissance), or PIC, aiming to accelerate growth in three selected regions. The PIC programme would provide a minimum infrastructure platform to allow the development of agriculture and agro-processing, mining, tourism and export processing zones in these regions. It would rely on public-private partnership (PPP), whereby public investment would cover most off-site infrastructure while private investment would secure on-site investment (World Bank 2003). More specifically, the strategy aimed to establish 1) an Export Processing Zone (EPZ) for manufacture production near Antananarivo, 2) the consolidation of a tourist destination in the costal area, and 3) the development of the mining sector in the Anosy Region.

6.2.2 The QMM project

QMM is managed and controlled by Rio Tinto, which owns an 80 per cent share of the project. The government of Madagascar, through its public company OMNIS, owns the balancing 20 per cent. While the characteristics of the mineral deposit fits with Rio Tinto's well publicised target of large, long-life and low-cost operations, the company identified country risk, and particularly the extremely harsh economic environment around the mine, as the main difficulty faced by the operation. Partly driven by risk mitigation, from early on, the company made notable efforts to understand the expected direct economic contributions to be expected from the business (Rio Tinto Economics Department 2004). At a steady state, Rio Tinto's early estimate of total value of production (FOB) was over US$100 million per year. In this calculation, value added represented more than 70% of the total. As discussed in previous chapters, a large value added is a typical feature of modern mining, and it is primarily explained by the intensity of capital required to operate. This capital intensity is reflected in annual allowances for: (a) interest payments for money previously borrowed from the financial sector, (b) repayments to shareholders in the form of dividends for their provision of capital, and (c) the cash retained in the business to replace depreciated assets and to fund future investments. For illustrative purposes, these three elements have been split here in equal parts. The remaining 27% of value added takes the form of labour costs, tax and royalty payments.

Figure 6.2 – Projected composition of QMM's economic contributions

Source - QMM



With regards to the company's potential for direct job creation, during operation QMM will directly employ over 700 people in Fort-Dauphin, including contractors. The company's assumption is that the majority of these vacancies will be taken by locals from day one, although QMM has anticipated that a transition period will be required to fill high skilled and senior management roles with Malagasy nationals (see Table 6.3). This transition will demand a significant effort in terms of training and skills development at the community level. The company has estimated that there will be an average of six direct dependents from each job at the mine. There is no sufficient local data as to assess the level of employment multipliers accurately, although the labour intensity nature of most economic activity in Fort-Dauphin, as well as the widespread availability of cheap labour, would presumably imply these to be high.

Table 6.3 – Projected direct employment by the mine

Source - QMM

Year of production	1	2	3	4	5
Year	2009	2010	2011	2012	2013
EMPLOYMENT (full-time equivalent)					
QMM direct	550	550	550	550	555
- Expats	50	50	25	25	5
- Local	500	500	525	525	550
Direct contractors (between 150 and 200)	150	150	150	150	150
Total employment (mine)	700	700	700	700	705

In terms of direct government revenues, QMM estimated that payments in taxes, royalties and other duties will amount to almost US$20 million per year once in full production. Table 6.4 shows that income tax will be by far the largest type of contribution, followed by dividend tax. In this example, however, QMM will have been in operation for years. In fact, the company will not declare profits for some time after inception, however, and thus profit-related contributions will not take place right away. In addition, the government of Madagascar exempts large capital investments from paying income tax for some time, which in this case will be five years after generating profits for the first time[86]. Some observers have expressed concerns with regards to the geographic split of government receipts, claiming that current government provisions are detrimental to the mining regions (for instance, Harbinson 2007). The new Mineral Law provides for devolution of a fraction of royalty payments. Royalties are set at 2% of total revenue (FOB). While 30% of the total goes to the central administration, the balance is expected to return to the host province, Toliara, and the region, Anosy – 10 and 90% respectively (Government of Madagascar 2007). Instead, income and dividend tax, as well as custom duties, all go straight to the central administration.

Table 6.4 – Direct government income from QMM

Source - QMM

US$ million	year 22
Local duties	0.7
Mining royalties	2.0
Custom duty and fuel taxes	2.0
Income tax	9.0
Dividend tax	5.1
Total	18.8

At the time of writing, QMM management had expressed optimism that external pressure, – expected primarily from the World Bank -, would ensure that a larger portion of the total government take would be made available to the regional and local administrations during operation (Dean 2007). The company understands that it

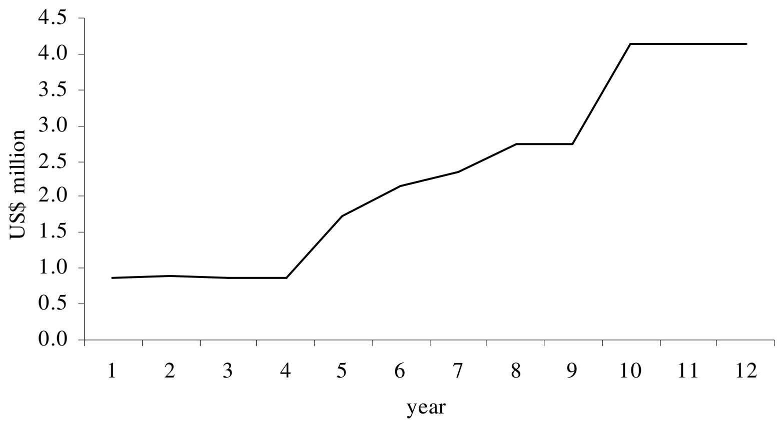
[86] For this reason, this annual snapshot is a suboptimal indication of total government benefits. Next section focuses instead on the operation's overall impact on Madagascar throughout the life of the mine, in present value terms.

would benefit from, and thus claimed it would support, a more equitable formula than the one currently in place. While QMM's regional engagement strategy will be positively influenced by larger flows of money into the local economy, this is an issue that lies beyond the company's' direct accountability. Moreover, in addition to the geographical distribution of monies, QMM reputation would also be affected by the ultimate use of these revenues. In this sense, Robert Mills (2007), Financial Controller QMM, said '*It would be important for us to understand whether the tax and royalty money that comes back to the region will be administered by the Chef du Region or whether the multilateral organisations would have a say'*.

In addition to value added, approximately 30% of projected annual revenues correspond to payments to suppliers for goods, materials and services. These estimates are only inclusive of operating supplies, and thus exclude purchases that correspond to the construction phase or further capital items. Given the unsophisticated industrial capacity of the Malagasy economy, the current estimate for local content in the supply chain is very low. Yet, figure 6.3 shows a ramp up process of import substitution reflective of QMM's procurement strategy, which is expected to go from US$1 million to over US$4 million during the first decade of production. The company has repeatedly said that this will demand intensive bottom up work to strengthen the capacity of local suppliers from early on (Dean 2007). Current initiatives include training efforts, microfinance schemes and business incubators, among other (more on this below)

Figure 6.3 – Expected value of operating supplies sourced locally

Source - QMM



Direct upfront investment in the mine and further infrastructure by the company was estimated at more than US$460 million in Madagascar[87]. In addition, making up the remaining capital requirement for the enterprise, the company has agreed to finance the 20% share of OMNIS with an interest-free loan from QIT, with repayment to be made at the completion of construction. The bulk of the construction process is expected to take three years, to be followed by another three-year ramp-up. Employment during a mine's construction is substantially larger than during operation, and often implies a different skills profile. Early during the second year of construction, the total workforce involved amounted to 1,457 people in Fort-Dauphine; 747 sourced from local communities, 640 from elsewhere in the country, and 70 expatriate workers. As the construction of the port was about to commence, however, these figures were set to expand, and the total number of foreign employees were also expected to rise substantially.

Regardless of these direct contributions, however, from day one Rio Tinto argued that developing QMM would require a different approach altogether (QMM 2001). As discussed above, the Anosy is one of the poorest regions in the world and home to a wide range of unique and endemic flora and fauna; for these reasons, a sustained and coordinated high profile campaign by environmental groups against the project was always recognised as a critical threat. From early on, the company invested heavily in addressing environmental issues, including leading-edge technologies in dune rehabilitation and, more broadly, in developing a network of technical alliances with environmental organisations, including Kew and the Missouri botanical Gardens. These efforts led to a situation where risk of significant environmental opposition appeared to have receded. The debate has since moved on substantially, and most environmental groups in Madagascar now acknowledge that the fundamental cause of environmental degradation is poverty, and that orderly economic development is thus required in the region (e.g. QMM 2001, the Economist 2007). Most of the project criticism has since tended to focus on social issues.

Some of these challenges could have severe consequences for QMM. For example, large scale speculative migration, if not anticipated and managed properly, could

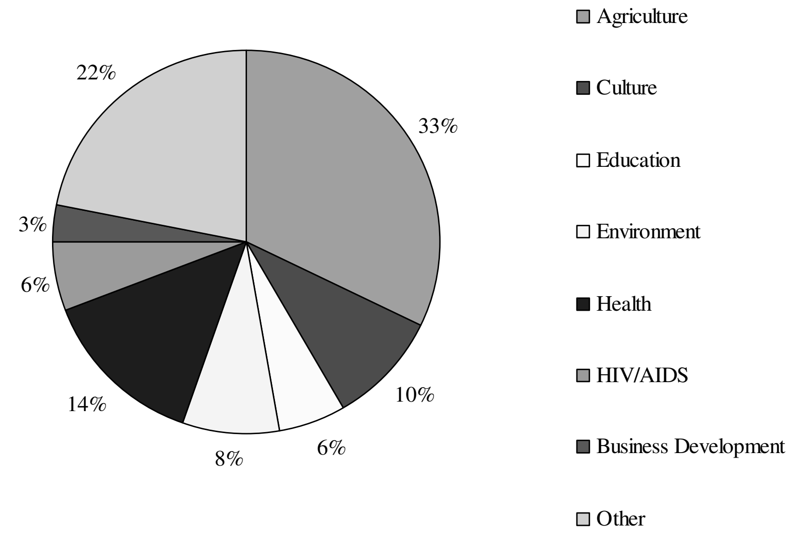
[87] Complementary to the investment in Madagascar, Rio Tinto has also approved further investment in upgrading the company's processing facilities in Canada (QIT)

increase competition for scarce resources in the region significantly, including land, fuel, water and food. Also, a potential impact on the community through HIV infection would be particularly high in early stages of the project, when large numbers of South African construction personnel, with high average HIV rates, would be introduced in an environment where HIV infection rates are low by African standards, but where high rates of sexually transmitted diseases would likely facilitate the spread of the virus. Given the magnitude of the social risks, the usual Rio Tinto approach to community investment (CI) was to take a different dimension in this project. QMM has pledged to invest in the order of US$900,000 per year in direct community investment during the life of the project, though according to their records, current commitments have already surpassed this. Some of these early investments became contractual obligations later on, mainly including environmental issues such as the restoration of affected areas to their status prior to mining. These also include compensations and a resettlement plan for some eighty families that had given way to the mine, and some specific programs for the population whose sources of income will be affected by the project, such as a small group of fishermen (QMM 2005).

Around 80% of the expenditure in social programs, however, is in fact non-contractual contributions (see Figure 6.4 for details). This mainly includes HIV/AIDS programs and other health initiatives, education (including the training of mineworkers), and other income generation initiatives such as programs supporting local SME development. The company has aspired to build an effective network of specialist partners – but otherwise is trying not to be drawn into activities it has no mandate or expertise to deal with, or where others, such as government or aid agencies, must play the leadership role (QMM 2005). Table 6.5 outlines the basic distribution of responsibilities as envisioned by QMM. For instance, QMM claimed to have been instrumental in the setting up of the micro-lending institution mentioned earlier by taking charge of salaries and logistic costs, and by contributing with US$20,000 to a rotating fund with the view that once the fund has reached full operating volume (estimated at US$300,000) it would be handed over to partners such as the UNDP. The company claims that around 1,000 local people have already joined the scheme (Razafindramosa 2007).

Figure 6.4 – QMM community investment by sector

Source: QMM 2007



Another example of this preferred modality can be found in the Global Development Alliance (GDA), a local partnership including USAid, the local government (Chef de Région) and QMM, which was formed with the objective of fostering local economic development in the project area, although it has so far committed most of its efforts to issues of HIV/AIDS and malaria. The second phase of the GDA started in 2006, with up to US$6m to be invested locally over three years, funded in equal parts by QMM and USAid (GDA 2006). The company has also committed significant resources through an urban planning scheme for the town of Fort-Dauphin, as well as through the financing of a comprehensive regional development planning process – perhaps the most innovative initiative thus far –, explored in more detail below.

Table 6.5 – Corporate social investment – focus areas and key responsibilities

Source: Rio Tinto 2007b

RT Lead	RT + NGOs lead	NGOs Lead
- Infrastructure development	- Education and school support	- Welfare
- Direct and indirect job creation	- Staff volunteers	- Arts, culture and sport development
- Supply chain development and SME support	- Support to government development initiatives	- Bursaries
- Outsourcing - subcontracting	- Micro-lending	- Animal care and agriculture
- Primary Health Care and training practitioners	- Internet and computer facilities in education	- Public services development
- HIV/AIDS	- Building a broader entrepreneurial environment	- Disaster relief programs
- Environment	- Sharing expertise and distributing information	- Literacy programs

In short, QMM's direct economic contributions to the region should be primarily expected to arise principally from the recirculation of royalty payments, but also from local salaries and wages, and from the payments to a number of local contractors which should increase over time. In absolute terms, these will represent a large injection of cash for such an impoverished economy. The company has been very vocal in its support for local businesses, including preferential procurement policies for local suppliers and distributors, and for the employment of local people backed by considerable training efforts. Direct CI is also significant. New rhetoric has contributed to differentiating the company from the old philanthropic models of corporate engagement. While investing heavily in a variety of health, education and income generation programs, QMM has repeatedly claimed to define its investment priorities in an open and participatory manner, prioritising partnerships with the view of leveraging capital and expertise from specialist parties.

Rio Tinto recognised that the fate of their long-term investment in Madagascar was intimately related to that of Fort-Dauphine (for instance, Rio Tinto website). However, underdevelopment in the area was a structural condition, not just the result of circumstantial shortage of capital. No matter how well organised direct investment in the community was, significantly reducing social risk would require a bolder approach. This call for radical action encouraged the company to become the pivotal element in a broader regional development scheme. This was going to demand capital and, perhaps more importantly, the strong support of, and commitment from, the government, the international community, and the local population. Together with this commitment came a number of challenges to QMM, of which two deserve early mention: i) the internal risk of overlooking the company's fundamental mandate as a profit making organisation, and ii) the external risk of being seen as impinging on government sovereignty. The rest of this study will thus shift attention to the emergence of this approach and to the extensive engagement process that it entailed.

6.3. Building capacity – and a regional development plan

Modern growth theory has indicated that sustainable increases in output cannot be achieved solely through capital accumulation, and has explained why policy efforts should additionally aim at securing steady increases in productivity rates. Similarly, this chapter opened by claiming that heavy investment in infrastructure with little emphasis on other development factors has proved an inefficient development tool. In particular for mining, a fundamental challenge is how to develop targeted policy actions that can maximise benefits from capital-intensive investments and sustain economic growth once the initial accumulation of capital has taken place. Recent development literature emphasised the need for complementary development elements such as the strengthening of human capital, the supporting of services to local enterprises, or the wider diffusion and assimilation of technology and managerial practices, to name just a few (Rodriguez-Pose 2002, Vazquez Barquero 1999). In this sense, a most critical dilemma is often how to address these issues within a context of extremely weak local governance and institutional capacity.

Towards the end of the 1990s, QMM became instrumental in the establishment of an innovative institutional architecture at the regional level. The key driver behind this effort was the overall requirement for an environment more conducive to sustainable economic development. While the company saw orderly regional development as a key risk-mitigation strategy, and was thus prepared to champion this process, it also realised that the challenge was beyond its expertise and that it would never be able to achieve the desired outcomes on its own. There was also increasing recognition that, to be effective, ownership of this process would have to sit with a broader group of local players, while a process of wider coordination would have to be facilitated. In addition, the successful development of the region would be expensive, and while significant, direct project inputs would only contribute a fraction of the required inputs (Cochrane 2008). As a response, QMM promoted the establishment of the Comite Régional pour le Développement de l'Anosy (Regional Development Committee of Anosy) – including the lions' share of its required operating funding.

The Comite Régional pour le Développement de l'Anosy, or CRD, was a local development agency integrated by representatives of the local government (i.e. the Chef du Région), donor organisations, NGOs, and the private sector. This Committee was quickly recognised, praised and backed by most local players including the World Bank. In 1999, the CRD launched a locally-driven and consultative regional planning process to determine the best long-term strategy (2005-2025) for the development of the Anosy region. This participatory process led to the formulation of a regional development framework known as the Schéma de Développement Régional de l'Anosy, or SDR (CRD 2001). The purpose of the SDR was to promote sustainable economic development through an agreed investment plan negotiated under the active participation of representatives from the public and private sectors. In describing the SDR, James Dobbin (2006), Chief Regional Planner Anosy Region for the CRD, said:

> *'The development process of the SDR, as well as its products, are unique to Madagascar and give the local population (players) the opportunity to make a legitimate and serious contribution, and to change the current direction of the Anosy region towards a more certain and prosperous future. […] Simply, the SDR represents a knowledge, dialogue, planning, and implementation tool. It also constitutes a set of guidelines making possible to direct the framework's regional and communal actions in regards to development and planning'* (p9)

In effect, the SDR became a platform of consultation from all players whose long term vision for the region included:

- Permanent regional consultation;
- The identification of key axes of development;
- The identification of potential synergies among different development sectors;
- Permanent communication and wide coordination of main regional players;
- Follow up and evaluation of the identified action plan

Based on the SDR, the Anosy region developed a mid term (5 years) strategic plan – Plan Regionale de Developpement (PRD). This PRD addressed the economic and social challenges particularly in relation to the national Poverty Reduction Strategy Paper – PRSP (or in French, DSRP). The PRD approach to economic growth was based on the region's diverse economic potentials, encompassing agriculture, fishing, mining, ecological restoration, biodiversity conservation, tourism, physical infrastructure, and social infrastructure – i.e. including education and health (PGRM 2006). The PRD was then a combination of key economic sectors organised in sub-regions, or nodes of development, which are explored in more detail in Figures 6.5 to 6.11 (based on Dobbin 2004).

Figure 6.5 – Agriculture and fisheries
The productivity of local plantations could be increased significantly, and the arable land expanded without affecting the native forest, through strict geographic delimitations, training, irrigation, and the rehabilitation of internal roads. There is potential to boost the export of exotic fruits (mainly produced in the fertile valleys in the north), lobsters and other seafood

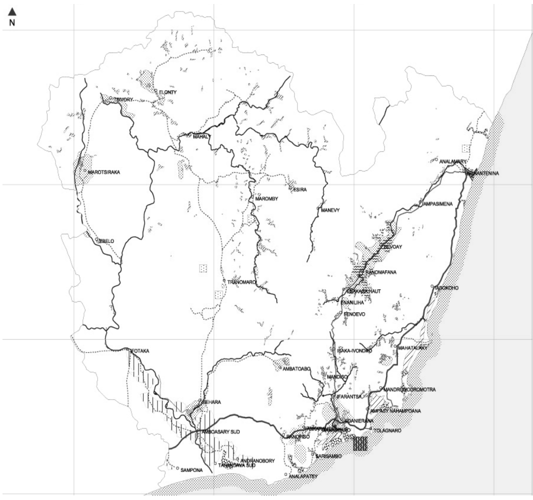


Figure 6.6 – Mining
This graph shows the location of the mineral potential in the region, represented here by QMM’s licenses, a comparatively thin strip along the coastline near For-Dauphin. There also appears to be potential for the economic exploitation of bauxite and granite deposits.

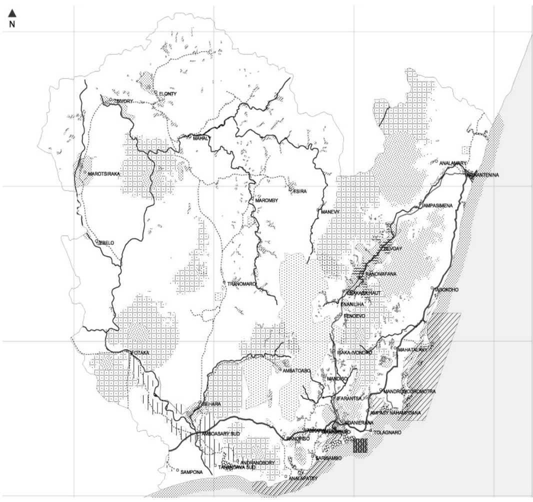


Figure 6.7 – Conservation
Both the SRD and PRD make explicit reference to zones that have a unique value in terms of biodiversity. These areas include the Andohaela National Park, and are thus expected to play a key role in attracting eco-tourists. Defined as no-go areas, any expansion of the private sector is restricted by this demarcation.

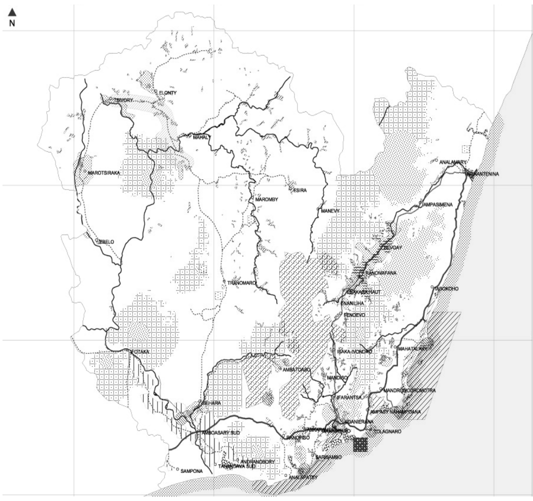


Figure 6.8 – Tourism

The natural beauty of the region makes it a potential tourist destination, though a lack of basic infrastructure has played against it. Efforts are to concentrate on sanitation and basic urban infrastructure, roads and communications. The plan aims at consolidating the ecotourism business first, and building a more sophisticated industry with time.

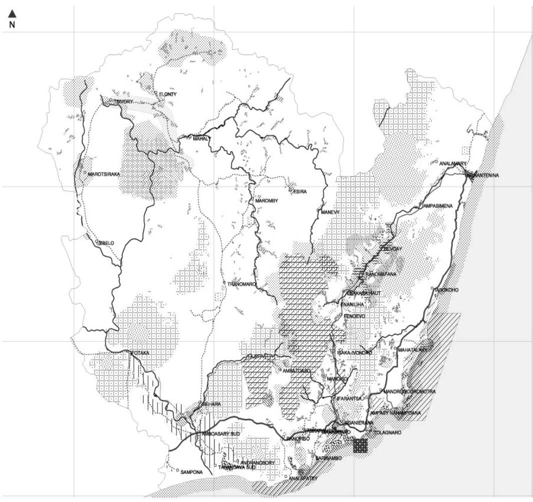


Figure 6.9 – Restoration

In addition to the allocation of no-go areas, the plan defined some places in need of urgent restoration, where the native forest had been more severely damaged. The scheme included plans for sustainable trees plantations, so as to provide the natives access for sustainable sources of wood.

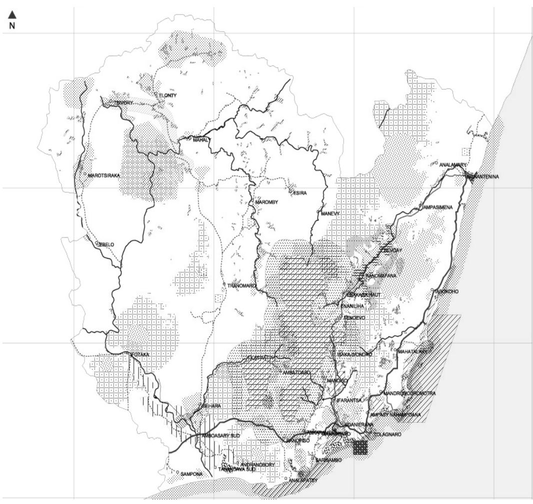


Figure 6.10 – Infrastructure

This stage in the process identified and incorporated all the cross-sector requirements in terms of regional infrastructure to enable the plan, including internal roads, basic sanitation and other urban works in Fort-Dauphin, irrigation, dunes' stabilisation etc, as well as social infrastructure including training and education, and health.

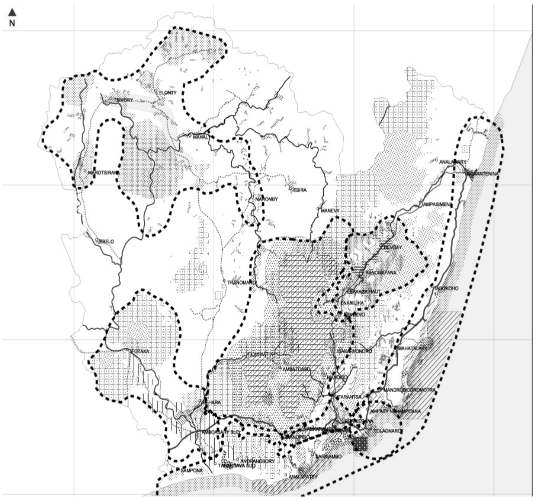


Figure 6.11 – Nodes of development
In order to facilitate a subsequent implementation and investment strategy, the CRD, through the SRD, identified the seven nodes of development pictured here. Later on, the Plan Regionale de Developpement, led by the Chief of Region, added four extra nodes. The final eleven nodes are illustrated in Appendix 1.

The nodes of growth described in Figure 6.11 were defined as those sub-regions believed to convey the highest development potential, i.e. soil quality and hydrology, location of mineral deposits, proximity to tourist attraction etc. These sub-regions provided a physical platform, or spatial framework, for the delivery of integrated services and investments to secure better economic synergies and materialise the development opportunities identified (Dobbin 2006). As both the SRD and the PRD consolidated, however, it soon became apparent that the absence of a reliable harbour, a gateway to the world, had become a bottleneck for these economic development plans more broadly. At this point, the economics of QMM were also jeopardised by the inexistence of a deep-water port in the vicinities of the mine. The economic interests of a number of separate regional players started to concur. If the required mining port could accommodate a multipurpose facility, then the potential from the economic sectors described above could be realised, helping locals appropriate a significant fraction of the positive externalities arising from QMM. At US$140 million, the port represented nearly 1/4 of the total capital initially estimated for the project.

6.4. A concurrence of interests

These development opportunities brought in by the project soon caught the attention of the World Bank, which subsequently decided to focus one of its proposed growth poles of development on the Anosy region. Both the Bank and the company would benefit from the development of key regional infrastructure, but also from economic development more broadly and the consequent reduction of poverty – as this is the *raisons d'être* for the former, and risk insurance for the latter. This concurrence of objectives opened the door to the exploration of further synergies and defined the parameters for a strategic alliance. The Bank would contribute towards the financing of the port and other development initiatives (further infrastructure, education and health), as long as the project was able to demonstrate its potential for contributing broad-base economic growth. For Rio Tinto, the World Bank involvement constituted a additional reassurance that the social and environmental aspects of the project were being dealt with properly and would thus play an additional role in mitigating company risk. Moreover, QMM could raise the standard for new mining projects in developing countries and become a flagship project for the industry from the perspective of sustainable development (QMM 2001). The business case for promoting regional economic development beyond Rio Tinto's strict business activities seemed all too clear.

This strong scope for collaboration did not come without challenges. For the company, the Bank can represent a rigid and bureaucratic organization; work culture is substantially different and communication can be difficult. Conversely, the project would be among the first large mines to receive strong World Bank endorsement since the independent World Bank Extractive Industries Review (EIR) published its final report in 2003, which concluded that international organisations should be discouraging mining in developing countries (WBEIR 2003). The Bank anticipated heavy criticism and scrutiny both externally and from within the organisation. Despite the growing consensus that development of the local economy was crucial to prevent further environmental degradation, some environmental NGOs, including Friends of the Earth, WWF and others, have continued to vigorously oppose the project (e.g. FoE, undated). The Bank needed to build a strong case if it was to help develop the mining sector in Madagascar. The negotiation and collaboration process that followed was mainly driven by the need to:

- Develop a model for understanding the economic impact of this investment in the region;

- Provide technical arguments and articulate a case in support of a collaborative approach, particularly the possibility of the Bank financing part of the proposed multipurpose port, in spite of some hostility against mining in developing countries and the particular sensitivity around Madagascar;
- Set the agenda for collaboration between the Bank, the Government and QMM

In collaboration with QMM, the World Bank embarked on the task of assessing the value of the proposed port as a development instrument in Madagascar, a precondition to decide whether it was worth investing in. The Bank's first approach to assess large infrastructure projects in developing countries typically centres on the government's capacity to pay back from the project's returns, which in essence constitutes a cash flow analysis discounted at certain rate (10%, in this case). This first model has thus focussed on government receipts. While the multilateral organisation was never going to finance the mine, the emerging consensus was that the entire investment should be considered (i.e. mine and port) rather than just looking at the port – the rationale being that economic benefits would arise from the complete investment system, and that without the port the mine would never be developed.

Several contesting points emerged right away. For example, QMM's position was that a discount rate of 10 percent (in real terms) was very high, especially because some of the benefits arising from the project are not profit-related (royalties, personal income tax, duties, etc) and therefore convey a lower risk of volatility in the government revenues. The government's ability to repay any loan obligation from the project cash flows seemed robust. Against this argument, the Bank claimed to use a flat NPV10 for first approaches and consider country risk-free rate in subsequent analyses. The Bank later accepted to run complementary scenarios discounted at 8 and 12%. Also, the company questioned the WB's proposition that the residual value of the port, provided that it was properly maintained, should decline in real terms by 60% in 25 years. There was a strong positive message in the fact that the region would own a functioning deep-water port as a result of this investment. The Bank claimed that the effect of any residual value attributed to the harbour would be small in present value terms. It also argued that the port would represent an asset only if it had been able to promote economic growth after mining has ceased – otherwise, it would constitute a further liability for the country, and it was thus removed altogether from subsequent analyses.

While some technical discrepancies were to persist during the discussions, subsequent analyses built-in two additional dimensions into the model: first, it incorporated all direct economic benefits (essentially, retained value added, local payments for materials and services, and direct expenditure in community investment); and second, it included in the cash flow some of the indirect economic benefits expected from the project's capacity to unlock the development potential of the region. The focus thus shifted towards the integrated regional development plan – i.e. synergies from the mine, port and further regional investment – rather than on the fiscal impact of the project only. This increased the dollar value of the estimated benefits for Madagascar notably. In essence, the message emerging was that the greatest significance of this investment was in the potential for catalysing economic growth. This model took the form of a Cost-Benefit analysis, which is attached to this paper as Appendix 2

Some further adjustments were still necessary. For instance, US$2m annual investment in soft factors of development needed to be incorporated, including expected investment in social programs and environmental initiatives by the company and its partners. Nevertheless, the new model centred on the benefits for Madagascar as a whole, which appeared to be positive – a present value of $48m. Moreover, in addition to providing the necessary direct government revenues to repay a potential loan, the new model recognised that the port and mine investment had the potential to trigger a concatenation of positive effects and promote regional economic development more broadly, which is captured in the row 'Regional Development' (Appendix 2). In order for this development to materialise, it was acknowledged that further investment had to take place outside the mining sector, and thus the Bank included $26m for this purpose (see row 28, 'Other Infrastructure Investment Cost'). While this new approach represented a conceptual turnaround in the thinking about the project, it also unveiled the difficulties of estimating the potential for increases in regional output. An illustration of this is the apparent absurdity of committing $21.5m (present value) to promote economic growth worth just $6m (rows 28 and 8 respectively).

The real technical challenge then became to produce sound and credible output projections in sectors others than mining. It was clear that there was no local capacity in governments to produce these estimations accurately – and, given the evident incompatibility of interests, the company was not well placed to take on the job. All key players involved thus acknowledged the CRD as the ideal entity to produce this analysis, which became known as the Regional Investment Strategy (Stratégie d'Investissement Régional), or SIR. In collaboration with the local and central government, NGOs and the investor and operator of the mine and port, the Committee was asked to identify and prioritise $30m worth of infrastructure investments[88] that would best contribute to unravelling the economic potential of the region. Following the direction set by the SRD and PRD, the SRI incorporated various inter-sectoral investment projects with potential for public-private partnership development, calculating cost/benefit ratios for each of them.

The expected increase in output in each sub-region was then priced and attributed to the integrated system of investment. The SRI proposal aimed at accomplishing quick increases in productivity. Simply, it contemplated direct investment in three general sectors: a) transport and road rehabilitation; b) agriculture, fishery and plantation forestry, including irrigation, drains etc, and c) tourism infrastructure. A summary of these projections is presented in Appendix 3. These calculations indicated that, after ten years, these investments would increase the regional value of production to circa $37m annually, and would generate extra direct employment for around 26,000 people (Dobbin 2006). This would determine a present value far higher than the $6m initially proposed by the Bank. In short, this work and extensive dialogue between the Bank and the company was ultimately able to reveal the strong economic potential of the region. The World Bank's pre-appraisal report strongly supported the development of the mine, port and complementary infrastructure. As part of its PIC strategy, the Bank committed a total of $60m to the region; $35m towards the port, and the balance for financing the complementary regional development initiatives discussed earlier. QMM, on its part, committed to the largest private investment ever to be deployed on the island thus far.

[88] This assumed that $4M was provided as domestic counterpart against WB financing of $26M

Two further World Bank initiatives are worth mentioning given their potential implications for both the region and QMM. First, the Dynamic Mineral Resources Management Project (Project de Gouvernance des Ressources Minérales), or PGRM, is an initiative of the Malagasy government funded by the World Bank, established to promote the mining sector. The objective of the PGRM is to assist the government in implementing a strategy to accelerate a sustainable development of the industry with a view to contributing to poverty reduction. More specific objectives include (i) improvement of the transparency and governance in the mining sector; (ii) institutional reform for a decentralised management of the mineral resources; (iii) promotion of private investments and value adding activities; (iv) rapid growth of the mining sector and increase of the economic impacts for the population, and (v) improvement of the natural resources management to prevent environment degradation. More recently, largely building on the SRD and the PRD, the PGRM launched a first pilot study on the Anosy region (PGRM website, Stanley and DeVerle 2006). This could have significant implications for the region and has raised expectations that the program may help maximise the level of mineral revenues flowing back to the Anosy.

Second, the International financial Corporation (IFC), the private arm of the World Bank Group, has started to promote the idea of CommDev in Madagascar. This initiative was one of several actions IFC promised to counter criticisms of donors' involvement in the extractive industries made in the World Bank Extractive Industry Review (WBEIR 2003). CommDev aims at establishing itself as a community development fund and at working collaboratively with PGRM to ensure that mining yield long-term benefits for local people. Again, their aspiration is to use QMM's investment in Anosy as a pilot case, and have ascribed to the objectives of the SDR. CommDev would be funded by direct financial contributions from donors, government and industry, including QMM. They anticipate this could be supplemented by a royalty share scheme – in essence a guaranteed allocation of the royalty payments by the company. Regardless, CommDev's target is to become an independent and self-sustaining institution (CommDev 2007). On this point, there has been some scepticism with regards to their implementation credentials. Also, since management capacity is in such short supply, and given that one of the most valuable skills that both the World Bank and QMM bring is their management expertise, it seems short-sighted that they should be sidelined. Deliberations on the future of this proposal were still ongoing at the time of writing.

6.5. Delivering the mine of the future

To summarise, this new approach to mining and regional development generated a great deal of optimism as the project moved into construction. QMM portrayed this undertaking as the finest example in a new generation of mines that would help regions set a development process in motion, while a broader range of economic activities other than mining would secure sustainable development thereafter. Together with a sophisticated management of the environment, this enterprise would be able to offset some of the negative implications of mining and deliver a net positive impact on the region (QMM 2003, Rio Tinto 2005, 2005b). Underpinning this approach was an unpredicted partnership between the company and the World Bank. As evidence of their mutual commitment to regional growth the Bank agreed to fund a portion of the multipurpose infrastructure, and QMM assisted with the preparation of an ambitious development scheme. A Regional Development Committee was established to deliver broader coordination of the many activities and financial commitments by different players, and to produce a Regional Development Plan. This plan, which had until that point enjoyed broad based participation and consensus, had also contained an agreed set of investment priorities.

It was only within this framework that the World Bank was able to justify a multimillion dollar contribution towards the infrastructure requirements of a mining corporation. Studies had shown that, well coordinated, the overall investment, (in contrast to isolated initiatives), would help the region unlock its full economic potential. Furthermore, this framework had already generated upbeat expectations from other organisations: this appeared to be a good development story and institutions like USAid or CommDev, among others, had already secured their participation – or were eager to join in. Fort-Dauphin also became a hotspot for NGOs working on social issues. Much of the current NGO effort is still concerned with relief and food distribution in the drought and poverty stricken areas to the south of the town, nonetheless. Without the macro-agreement described above, this NGO activity would have never been able to have stimulated growth on the scale envisioned by the SDR (Cochrane 2007).

Despite this promising outlook, however, a few fissures in the World Bank/QMM relationship became visible as soon as construction started. In conversation, Glynn Cochrane (2007), Senior Advisor Communities for Rio Tinto, suggested that '*Tension was always on the cards since the World Bank is used to dealing with slow moving poor country governments rather than nimble private sector entrepreneurs. And, let's be honest, both the World Bank and Rio Tinto are used to being in control*'. In his view, problems also aroused from the fact that the World Bank is not always well placed to pursue on-the-ground development. The Bank can deal with a country or a sector but has real problems focusing staff and resources on a specific region. It is often difficult for the Bank to make decisions with the speed required by the private sector (also in Harbinson 2007b)

This setback would have noticeable implications. Since early planning, it has been clear that there would be a lapse between the beginning of construction and the delivery of visible benefits for the broader population. Lisa Dean (2007), Principal Advisor Community Relations at QMM said '*It was always accepted that the process of construction would in all likelihood stimulate expectations that would be beyond the immediate capacity of the mine to meet. It was then that the complementary donor investment needed to start creating jobs and employment in other sectors of the economy. Although urgently needed, this has been slow to emerge'*. Even in the event that the PIC money is finally delivered, there is still a serious risk that these funds will not be efficiently used; initiatives such as the PRD, or the once highly-regarded Comité Régional de Dévelopement (CRD), seemingly lost momentum. '*It is frustrating to see all that rhetoric from before gone nowhere*' (Dean 2007). Significant delays, in fact, would generate risks for both QMM and the World Bank, because:

- Without substantial regional investment outside mining Fort-Dauphine might well become a mining town;
- In the absence of the promised flow of capital into the region the World Bank will face a charge that they are subsidising a mining company;

- Without inward investment the needs of the region may exert pressure on QMM to increase its social investment drastically.

By the time construction begun, the company was starting to worry that the Bank's commitment to the Fort-Dauphin area may be arbitrarily re-allocated to other areas of Madagascar. Some World Bank staff were still concerned that working closely with QMM would bring criticism from the NGO's which had expressed opposition to the use of soft loan IDA money for the port, – and were also unsure whether QMM would take local and regional development seriously after project approvals were obtained. Regardless, Gary O'Brien (2007), Executive Director of QMM, remained largely positive: *'This has been new for both organisations, and an element of conflict was probably inevitable as both sides did things as they normally would at the start. However, I do believe we are making good progress – and that the Bank will commit the funds of the Growth Poles project to the Fort-Dauphin area'*.

6.5.1 Community issues

> *'The sleepy town of Fort-Dauphin in southeast Madagascar is trying to catch its breath. Lying in the least developed corner of one of the poorest countries in Africa, Fort-Dauphine is only accessible by aircraft […] But four-wheel drive vehicles have recently become common and locals congregate in the main square to watch cranes and lorries at work in the tiny harbour below. Hundreds of people have moved in from abroad and from other parts of the country.'*

With these words, The Economist (2007, p90) described the fuss taking place in Fort-Dauphine since QMM started construction. The commencement of engineering works brought with it the disruptions and physical and social changes that, while anticipated, would still pose critical challenges. *'Construction contractors go in and out, and do not particularly worry about certain community issues like, say, the local content of materials or provisions. We always knew that that would be the case – but the local population does not think in terms of construction stage vs. operation stage. For them, it is just QMM'* (Dean 2007). Willy Rasamoelina, Director of Community Relations for QMM (2007) points out that there is an intrinsic lack of entrepreneurship in the culture that makes the opportunities from an expanded demand for local products difficult to materialise. Progress has been made, though he agrees that the end of construction would make things easier. '*The delivery of the training package and micro-credit schemes that have been developed should help contractors in their relationships with locals. Yet, most of the problems we see today with South African contractors should finish when the Anglophone construction period is succeeded by a francophone operation'*. The effect of these disruptions was about to get worse though. The Economist's article went on:

> *'The town's few hotels and food prices and rents have doubled in the past year. Why? Because Rio Tinto, a global mining giant, has started work on a big mine just outside town'*

It was probably inevitable, given the lagging investment in other development initiatives mentioned above, that the company would be blamed for an inflation process that has been severe for some commodities. The construction of the mine and port attracted an influx of additional people to the city of Fort-Dauphin. These people have created an increased demand on the local market. Increased activities at restaurants and the food purchases by contactors have also had an indirect impact on prices. However, Hugues Razafindramosa (HR), Development Economist for QMM (2007), pointed out that *'This inflationary process also responds to causes other than QMM. The shortage of products in the local market is a result of appalling roads and other infrastructure. No storage capacity or refrigeration makes it impossible to store produce. Farmers rely on poor farming methods. Unseasonable draughts have made things worse, and have affected some products more than others (i.e. beans and lentils)'*. David Stone, Principal Advisor SD for QMM, has also stressed that the local inflationary pressure has been more related to global trends in food prices than QMM-induced reasons (Stone 2008). Immediate company initiatives to ease this pressure include providing assistance with the transport of products into the market; assessing and helping upgrade the market store capacity and refrigeration issues; promoting associative measures to better market management, and prompting the contractor companies to coordinate food purchases to minimise impact on local prices.

Table 6.6 – Inflation in Fort-Dauphin, selected items (in local currency - MGA)

Source: PGRM 2006

	unit	Jan-06	Jan-07	Variation
Rice	bag (50kg)	50,000	70,000	40%
Oil	litre	2,400	4,400	83%
Sugar	kg	2,000	2,400	205
Cattle meat	kg	3,000	3,000	0%
Salt	bag	150	300	33%
Lentils	bag	250	700	180%
Beans	bag	250	700	180%
Candles	unit	250	400	60%

This phenomenon seems to have exacerbated some pre-existing social conflicts. As the price for food and other local supplies went up, relatively well off local agricultural producers benefited the most. Rasamoelina explained that the economy is still organised as per the old colonial structure. White land-owners with safe land titles[89] own the best land, whose produce is mainly destined to the export market. There is a second class of Indo-Pakistani and relatively successful entrepreneurs that are the merchants in the region and manage the import/export business. Finally, the Indigenous people are mainly engaged in self-subsistence or small scale farming, and are often highly exploited by middle-men. '*With the exception of charcoal, which is sold directly by individuals, the agriculture system is mainly organised by Frenchmen. They have become the coordinators of the existing middle-men that pick up the locals' production that is then sold in the market'* (in conversation with Willy Rasamoelina 2007)

While most stakeholders accepted it was too early to assess the impact of the mine after just two years into construction, some groups have already raised heavy criticism. For instance, Friends of the Earth (FoE) has argued that, contrary to Rio Tinto's claims that QMM will increase incomes, inflation is aggravating local living standards for the poorest people. They have pointed out to an alleged growing local perception that '*Society is dividing into two tiers: a fast developing educated class able to participate in the development and the rest who are not able to participate*' (FoE 2007b, p5). In addition to the sharp rise of prices in Fort-Dauphin, the NGO has also claimed that people are generally angry that promises of employment have not

[89] Only 13% of people in Madagascar have property titles, which has impacted significantly in the development a formal housing market (HR 207)

materialised. FoE also claimed that, a year after being displaced, approximately eighty families that had to make room for the mine have not yet been allocated their new plots of land and so they have been consuming their compensation packages instead (also in Harbinson 2007b). In representation of FoE, Clifton (FoE 2007, p1) said that '*Rio Tinto claims that the Madagascar mine development is whiter than white, designed to benefit local people and preserve the unique natural environment. […] The reality on the ground is a murky shade of grey.'*

The company has argued that most criticism by FoE is unfounded and claimed, for instance, that the level of Malagasy employment by the mine, which sat at 1,800 people at the end of 2007, actually trebled the company's commitment made for local recruitment during construction (Rio Tinto 2007). In fact, Harbinson (2007) has also recognised that most local skilled workers have already been recruited by QMM, which in turn led to skills shortages in other sectors and inflationary pressure on salaries. Discussing resettlement, Lisa Dean (2007) claimed that '*There have been serious problems. It is important to stress, however, that resettlements are the responsibility of governments and the World Bank, not companies. The government conducted this process following the Bank's standards and approvals. QMM simply made the agreed payment'*. While accepting that there is '*room for improvement'* (Rio Tinto 2007 p1), the company attributes an inflexible attitude to FoE, maintaining that hey have always opposed mining on principle. Indeed, FoE has recently restated the claim previously made by the World Bank Extractive Industries Review (2003) that urges the World Bank to stop investing in future mining projects altogether (FoE 2007, 2007b)

All the same, as the company had anticipated, construction brought considerable socioeconomic turmoil. One local resident interviewed said that '*having always been a very quiet town, Fort-Dauphin became a complete chaos all of the sudden. Trucks, noise, and dust, and all those trees destroyed by the company'* (LR1 2007). Another local resident complained that '*Life is only better if you have a job with QMM. Salaries are good and you are paid every month. But for the rest of us, we still make the same income while everything is getting more expensive to buy in the market'* (LR2 2007). Change has had significant emotional implications too. A young native claimed that '*when I grew up, we used to wake up and go to the sea with my friends* *where they are building the port. It is all gone now; this place is not what it used to be*' (LR3 2007).

In contrast, other local players have been more supportive of all the necessary changes associated with economic expansion. *'Some environmental NGOs are very idealistic, romantic: the reality on the ground is much more complicated. There is extreme poverty in this area, severe education and health problems. You need to be able to feed these people. Orderly development is essential'* (Micol Sandrini, of PAM Madagascar, 2007). In the same line of argument, one local entrepreneur concluded that '*people are starting new businesses all around, the markets are full, hotels are being built. The reality is that people don't like change in general, but I say that it is a small price to pay. This place needed to be woken up, and it has been. I think there is a better future ahead of us'* (LR4 2007).

So far, this study has explored the potential and downsides of an approach to regional development new to the industry, in which a mining firm has taken a proactive role in filling up a void in the local system of governance by attempting to leverage capital and expertise from third parties, and by taking a leading role in their coordination. Yet, a different set of criticisms has related to the essence of this approach and argued that this is not the place for a private company. On this issue, Harvinson said that '*Rio Tinto […] should exercise restraint with its own involvement. It has extended its role from mining company to development actor, and has taken various steps to fulfil expectations and resolve grievances, but these have largely fallen short and failed to fully address the issues. Committees that have tried to play a negotiating role between competing stakeholders have fallen foul of accusations that their interests and motives are compromised by their relationship with the company. This has led some stakeholders to turn away from the table, and important development decisions have been made in their absence' (Harbinson 2007, p.4).*

With all its promises and uncertainties, it is clear that QMM has chosen a way quite different from the typical mining intervention in developing regions. This study has reviewed the key concepts, drivers and characteristics behind a new model that was still unfolding as this analysis reached conclusion. More broadly, whether the efforts behind this model have been worthwhile or not are yet to be determined.

6.6. Final remarks

The development of QMM provided a unique opportunity to look in detail into the planning process of a modern mine within the framework of sustainable development. In essence, this constituted an opportunity for an *ex ante* evaluation of issues repeatedly identified by the literature as significant challenges associated to the development of large extractive enterprises in regions with lagging economies, including the enabling of multi-purpose infrastructure, the distribution of revenue and its further reinvestment, the development of a local supply chain, local inflation, economic dependence on mining and so on. For the reasons discussed in this study, this project was conceived not just as a mining enterprise but as the fundamental driver of development in the Anosy region – and it has thus aimed at delivering tangible economic benefits to its neighbours, in addition to healthy financial returns to its owners. In this sense, the most distinctive feature of this process has been the new role adopted by the company as a proactive catalyst of growth. This fundamental shift from previous roles has not gone unnoticed by mining critics, which have already questioned its legitimacy.

It is too soon to conclude whether QMM's enlarged approach succeeded in delivering its promise of sustainable economic development. Some warnings emerged early on. As predicted by the project's developers, considerable economic turmoil hit the region as soon as construction begun. There have been, on the other hand, some positive surprises. For instance, although the risk remains, early fears that speculative inward migration would prove to be the most severe social externality appears to have been unfounded. In any case, for all the good intentions, the real test will come at the end of construction, when the revenues from this investment system start flowing through the regional economy. In the long run, as with economic development elsewhere, a dispassionate *ex-post* evaluation of QMM will need to pay special attention to the multiple tradeoffs between both the physical and socioeconomic disruptions and improvements.

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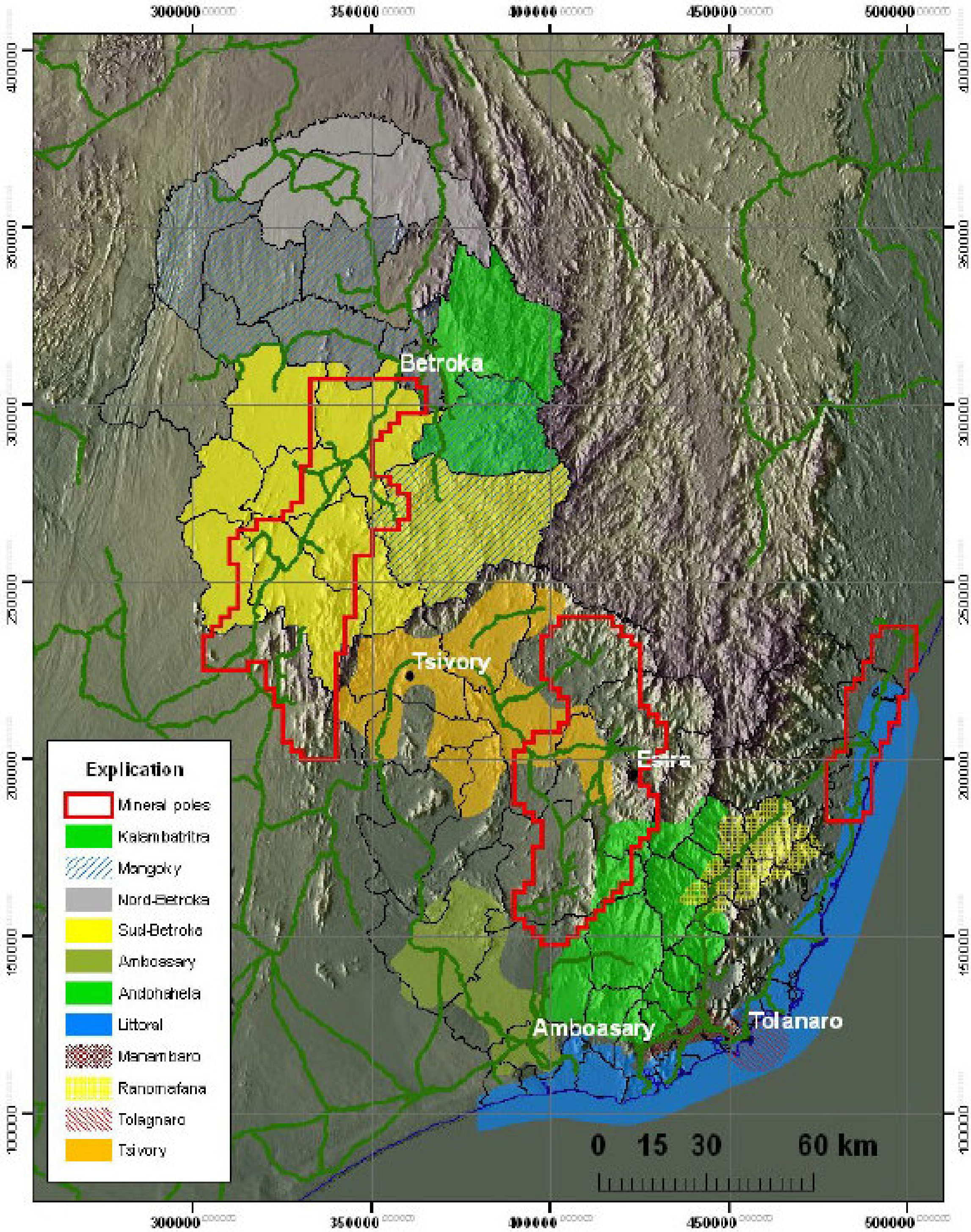
Appendix 6.1 – RDS and RDP growth nodes of development



Appendix 6.2 – World Bank cost/benefit analysis

Mine & port investment and further regional development investment (real US$1,000 discounted at 10%)

		NPV	Year 1	Year 2	Year 3	Year 4	Year 5	year 6	Year 7	Year 8	Year 9-25
1	*Benefits*										
2											
3	1. Port Activity										
4	Transaction cost savings	13,730	0	0	0	649	759	888	1,039	1,216	60,770
5	International Transhipment	530	0	0	0	37	50	67	90	119	1,017
6	Port Concession Fee	1,863	0	0	0	108	108	113	145	183	6,801
7	Port Tax	1,289	0	0	0	73	73	77	99	126	4,732
8	Regional development	6,080	800	800	800	500	515	530	546	562	12,548
9	**Total**	**23,492**	**800**	**800**	**800**	**1,366**	**1,506**	**1,675**	**1,919**	**2,206**	**85,868**
10											
11	2. Mining Activity										
12	- Local taxes	2,544	0	0	0	0	0	0	0	0	12,485
13	- Mining royalties	10,599	0	0	0	710	882	1,099	1,099	1,099	33,436
14	- Custom duty and fuel taxes	11,289	0	0	0	1,042	1,198	1,181	1,181	1,251	33,551
15	- Income tax	20,429	0	0	0	0	0	0	0	0	101,214
16	- Divident tax	14,721	0	0	0	0	0	0	0	0	70,242
17	- OMNIS dividend	49,876	0	0	0	0	3,663	5,845	6,248	0	171,497
18	- Income tax from local salary	10,081	0	0	0	772	937	1,116	1,317	1,524	29,035
19	- Income tax from expatriates salary	4,339	0	0	0	1,918	1,414	966	518	294	4,998
20	- Local salaries	11,521	0	0	0	882	1,071	1,275	1,505	1,742	33,182
21	- Rent on 15% of expat salaries spent locally	372	0	0	0	164	121	83	44	25	428
22	- Rent on local purchases (goods and services)	3,463	0	0	0	174	182	172	172	346	12,715
23	**Total**	**139,235**	**0**	**0**	**0**	**5,662**	**9,467**	**11,737**	**12,084**	**6,281**	**502,782**
24											
25	*Costs*										
26	Port Investment Costs	-59,639	-18,000	-36,000	-18,000	0	0	0	0	0	0
27	Port incre. Reccurrent Costs	-24,967	0	0	0	-2,341	-2,645	-2,980	-3,238	-3,540	-75,666
28	Other infrastructure Investments Costs	-21,533	-6,000	-14,000	-6,000	0	0	0	0	0	0
29	Other infrastructure Incre. Recurrent Costs	-9,022	0	0	0	-1,300	-1,300	-1,300	-1,300	-1,300	-22,100
30	**Total**	**-115,161**	**-24,000**	**-50,000**	**-24,000**	**-3,641**	**-3,945**	**-4,280**	**-4,538**	**-4,840**	**-97,766**
31											
32	***Net benefits***	**47,566**	**-23,200**	**-49,200**	**-23,200**	**3,387**	**7,027**	**9,132**	**9,466**	**3,648**	**490,883**
33	**Economic Rate of Return (ERR)**	**0**									

	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Total
1																		
2																		
3																		
4	1,423	1,621	1,846	2,104	2,397	2,732	3,114	3,551	3,887	4,254	4,508	4,667	4,773	4,856	4,936	5,013	5,086	60,770
5	158	170	168	147	123	98	73	46	27	8	0	0	0	0	0	0	0	1,017
6	228	215	229	240	266	299	336	376	410	447	487	531	544	547	548	549	548	6,801
7	157	149	159	166	185	208	233	262	285	311	339	370	380	381	382	383	383	4,732
8	579	596	613	631	650	669	689	710	731	752	775	797	821	845	870	896	923	12,548
9	2,544	2,750	3,015	3,288	3,621	4,006	4,445	4,944	5,340	5,773	6,108	6,365	6,518	6,629	6,737	6,841	6,940	85,868
10																		
11																		
12	0	0	0	0	1,302	1,244	1,186	1,128	1,070	1,011	952	893	834	775	716	716	656	12,485
13	1,361	1,636	2,024	2,030	2,030	2,030	2,030	2,030	2,030	2,030	2,030	2,030	2,030	2,024	2,024	2,030	2,030	33,436
14	1,591	1,753	2,076	2,076	2,004	2,004	2,004	2,004	2,004	2,004	2,004	2,004	2,004	2,004	2,004	2,004	2,004	33,551
15	0	0	993	4,923	5,049	5,259	5,429	5,566	5,676	5,766	8,758	8,846	8,919	8,942	8,991	9,028	9,069	101,214
16	0	0	893	4,430	4,544	4,734	4,886	5,009	5,109	5,189	4,963	5,013	5,054	5,067	5,095	5,116	5,139	70,242
17	7,407	9,566	11,886	10,920	10,619	10,550	10,497	10,457	10,427	10,404	9,863	9,847	9,836	9,792	9,782	9,819	9,825	171,497
18	1,602	1,641	1,719	1,719	1,719	1,719	1,719	1,719	1,719	1,719	1,719	1,719	1,719	1,719	1,719	1,719	1,719	29,035
19	294	294	294	294	294	294	294	294	294	294	294	294	294	294	294	294	294	4,998
20	1,831	1,876	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,965	1,965	33,182
21	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	428
22	428	469	550	550	825	825	825	825	825	825	825	825	825	825	825	825	825	12,715
23	14,539	17,259	22,426	28,933	30,376	30,650	30,862	31,023	31,144	31,233	33,399	33,463	33,506	33,433	33,440	33,541	33,552	502,782
24																		
25																		
26																		
27	-3,899	-4,136	-4,311	-4,394	-4,406	-4,403	-4,401	-4,400	-4,431	-4,465	-4,501	-4,533	-4,579	-4,628	-4,678	-4,727	-4,775	-75,666
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
29	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-1,300	-22,100
30	-5,199	-5,436	-5,611	-5,694	-5,706	-5,703	-5,701	-5,700	-5,731	-5,765	-5,801	-5,833	-5,879	-5,928	-5,978	-6,027	-6,075	-97,766
31																		
32	**11,885**	**14,574**	**19,831**	**26,527**	**28,292**	**28,954**	**29,605**	**30,267**	**30,753**	**31,242**	**33,706**	**33,995**	**34,146**	**34,134**	**34,200**	**34,355**	**34,417**	**490,883**
33																		

Appendix 6.3 – Quantifying regional economic benefits

Estimated impact of proposed US$30m in investments adjacent to the Fort-Dauphin growth pole, as identified by the SIR
All monetary figures in US dollars

Development Node (Sub-region)	Investment	Agriculture Target Area (ha)	Annual Agriculture Value: Base	Annual Agriculture Value: Gross	Annual Agriculture Value: Additional	Annual Additonal Tourism Value	Other Additional Production Value	Total Additional: Annual Value of Production	Total Additional: Jobs	Total Additional: Exports (t)
Ranomafana Valley	$ 7,800,000	4000	$ 750,000	$ 10,860,000	$ 10,110,000	$ 1,000,000	$ -	$ 11,110,000	8,000	14,550
FTD-Manambaro Corridor	$ 11,100,000	6000	$ 2,250,000	$ 13,860,000	$ 11,610,000	$ 400,000	$ -	$ 12,010,000	7,000	20,550
Tsivory	$ 3,600,000	6450	$ 2,438,000	$ 14,535,000	$ 12,097,000	$ -	$ -	$ 12,097,000	6,500	21,900
Coastal (Middle Coast)	$ 5,000,000	-	$ -	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ -	$ 2,000,000	4,000	667
Fort-Dauphin	$ 1,000,000	-	$ -	$ -	$ -	$ -	$ 250,000	$ 250,000	500	0
Total	$ 28,530,000	16450	$ 5,438,000	$ 40,255,000	$ 34,817,000	$ 2,400,000	$ 250,000	$ 37,467,000	26,000	57,667
Contingency	$ 1,430,000									
Total Financing	$ 30,000,000									

Chapter 7

Closing the circle: lessons learned and the way forward

7.1. Introduction

This research aimed to investigate an emerging number of questions vis-à-vis the effect of large mining enterprises on regional and local development, as well as their potential to improve economic standards and favour sustainable economic growth in the vicinities of large mines. In doing so, it explored the vast literature on resource economics and proposed a link to a consolidating school of thought on regional development and economic growth, namely the Endogenous Growth Theory, Institutional Economics and Local Economic Development (LED). So far, academia has stayed clear of mining when exploring these theories, and largely disregarded this sector as not particularly conducive to the type of growth they endorsed[90]. However, the early chapters of this work already called for a reassessment of this position. The type of interface between mining and the economy is not static, and the evolution of technology and social expectations has been continually reshaping the structure of the industry and explained, for instance, the shift from the Regional to the Global and more recently the SD model of mineral development. SD has since distilled some key principles from modern growth theory and offered large mining houses a policy guideline for practical implementation. Up until now, however, little rigorous research to explore the actual implications of these new practices had been conducted.

The interpretation of sustainable development endorsed by the industry warrants early mention. The approach adopted throughout this work is that generally referred to as *soft sustainability*. This view has accepted manmade capital as a surrogate for natural capital (Costanza 1991, Van Pelt 1995, Becker 1997). More specifically, this research has focussed on the economic aspects of this agenda. As such, it has looked at how successful new mining practices have been in substituting finite mineral resources for other forms of capital that can generate long term wealth, in particular for those communities most directly impacted by these activities. This is by and large the approach to sustainability embraced by the industry, and in particular Rio Tinto, towards the end of the 1990s (Humphreys 1996, Rio Tinto 2001, 2005, Clifford 2005). Many of the conclusions of this work relate to the nature of how, and extent to which, a shift in approach materialised and discuss whether today's practices are

[90] Some good work has started to bridge this gap more recently (including, for instance, Lederman and Maloney 2007) although this has focus on the macroeconomic aspects of this agenda for the most part.

fundamentally different from previous practices. Yet, other conclusions have queried the very nature of economic decisions made in the name of economic sustainability, and have in cases put the prevailing interpretation of this concept into question.

The last three chapters examined different Rio Tinto operations in detail, covering the most characteristic phases in the life of a mine. Each case study looked at the economic contributions from the operations, the distinctive characteristics of their host economies, and the economic interface between one and the other. They also identified the main emerging challenges with respect to economic sustainability as well as the responses put in place by the different local players. In closing the circle, the current chapter highlights the most important findings and lessons from these studies and goes back to the theoretical background used for this analysis. In introducing the overall conclusions, and before moving into a detailed discussion, what follows is an early review of the original hypotheses that framed this research. From the outset, this work put forward two complementary propositions: that (i) large mines operating under the SD model can provide a positive economic stimulus to local economies and become a catalysing force for wider economic growth; and (ii) in order for this to materialise, proactive economic management should be exerted.

This investigation followed a systematic method to disentangle the economic impacts from a company like Rio Tinto, which has strongly claimed to operate under the principles of SD. The assessment of the economic stimuli from the operations studied made evident the relative robustness of these impacts, confirming the frequent importance to sub-national economies often attributed to mining (Strongman 1998, Eggert 2001, McMahon and Remy 2002, MMSD 2002, ICMM 2006). However, not all impacts appeared in a positive light. In particular, large increases in cash flowing through these economies do not necessarily mean the same to all in the communities. When groups of locals had been unable to derive sustainable benefits from these incentives, reasons could generally be traced back to government failure regarding the economic fundamentals (Humphreys 2000b); the industry's inability to respond innovatively and dispassionately to the distinctive characteristics and limitations of different economies (Ross 2001, WBEIR 2003, FoE undated); and/or to cultural barriers impeding access to the opportunities created by these enterprises (Martin 1995, NEPRU 2000, Altman 2001). Thus, an alternative view emerging from these analyses is that large mines are often positively associated with some of the measures of economic development, while simultaneously negatively associated with others.

Yet, early this work suggested that the main economic potential from mining enterprises may lie not just with the companies' cash flows, but most notably with their ability to trigger a process of economic development more broadly, largely driven by their significant institutional and organisational presence, strong managerial capacity, and ability to influence local players and established structures of economic governance. The findings of this research support this view. However, while modern growth theories still regard investment as a key element in the growth equation, they also stress the importance of other factors that were previously underestimated. This turnaround calls for different and more proactive policymaking with regards to business generation, training and the transferral of skills, the consolidation of local institutions, or local economic development more generally. Thus, this research emphasizes that the agenda for advancing sustainable economic development in areas under the influence of large mines typically contains elements that have so far been beyond the mandate of corporations. Realising the full economic potential from these enterprises will require revisiting the accountabilities assigned to key players up until now (Humphreys 2000, 2002, Sachs 2008).

This chapter is organised in five sections. Based on the lessons from the case studies, the next section looks at those mining inputs with largest implications for the local and regional economies, and explores how these inputs may have changed under the SD model of development. Section three discusses the singular features of remote local economies under the influence of large mines, and asks whether preconditions have determined outcomes in these cases. Section four returns to the literature, re-explores the notion of economic sustainability, and examines the emergence of a new agenda for mining companies. Section five readdresses the main research questions, considers the key caveats to this work's conclusions, and ponders whether in light of this new agenda, mining companies should continue to be seen differently from those in other economic sectors. It also suggests possible research areas for academics to advance these conclusions. As a long commodity boom came to an end, the last section offers a final consideration on possible directions the industry may take regarding SD in the next turn of the cycle.

7.2. Direct economic benefits from mining operations

This work has referred to direct mining contributions as the aggregation of value added and payments to suppliers, whereas value added is defined as the sum of remuneration to labour, taxes, and capital repayments (De Grauwe and Camerman 2002). Intrinsic to the notion of SD is a shift in focus from the national to the local level (e.g. Strongman 1998, Eggert 2001, McMahon and Remy 2002). The cost structures of companies are set have obvious direct implications for the local economies that host them (think of the supply chain, for example), and the same can be said regarding the way in which companies go about acquiring the inputs for their business activities. This work has argued that some inputs hold larger potential to benefit local economies than others. At the lower end are capital repayments encompassing dividends provided to shareholders, interest paid to financers, and cash retained in the business to fund future investment and replace depreciated assets. While these payments are the fundamental enablers of mining in the first place, previous chapters already discussed that their effect at the local level tends to be negligible (for instance Di Boscio & Humphreys 2004). This section focuses instead on those elements with largest implications for local economies and discusses the key lessons emerging from the case studies in this regard.

7.2.1 Employment, the productivity of labour, and labour remuneration

In established operations like PI and RUL, employment is one of the most visible economic contributions at the local level. Trends for direct employment (as opposed to contracted-out labour) evidenced the shift towards an ‘all-staff’ policy adopted by Rio Tinto in the 1990’s, in which most of the labour force became salaried employees (Rio Tinto Economics Department 2006). Total employment (direct and contractors) decreased significantly until the early 2000s, which in turn contributed a conclusive increase in labour productivity (measured as total volumes of rock processed per employee). By 2004, however, PI was expanding its operations dramatically, and with that employment increased notably, together with the cost of labour (in both absolute and per-unit terms). Several commentators suggested that the new mining rush in Australia was now responsible for a significant productivity loss (Rio Tinto

Economics Department 2007). Likewise, the surge in prices that ultimately kept RUL safe from early closure prompted a rapid change in employment trends, with significant increases in total employee numbers materialising from 2005 onwards.

Chapter 1 claimed that local benefits from mining operations can be optimised when increases in company productivity are followed by increases in the productivity of the economy more broadly. Looking at national economies, Bravo-Ortega and Gregorio (2007) arrived to similar conclusions. Furthermore, higher productivity in the private sector has the potential to trickle down to the rest of the economy, helping improve the productivity of the overall economy more broadly (Krugman 1995). However, this work suggested that, due to the characteristics of remote economies, local increases in productivity will not always follow company trends (Di Boscio and Humpreys 2004). More particularly, local economic benefits from productivity gains at the company level will not take place equally at all local economies. Local profit from increases in the productivity of the mine will actually rise as host economies mature. In other words, the more dependent an economy is on the direct employment and income from the mines, the more difficult it is to perceive the potential indirect benefits arising from better technology and managerial spillovers, an expanding supply-chain, indirect employment opportunities, and so on.

Virtually all employees resided locally in the cases analysed. Highly paid mineworkers take jobs in remote locations for a short period of time, although their involvement in the local economy often continues for much longer than anticipated at the outset. This has been the case at communities as disparate as those of Swakopmund and Arandis, in Namibia, or remote settlements like those in the Pilbara, in Western Australia. As they live nearby the mines, mineworkers spend a large proportion of their income locally; and, depending on the characteristics of each local economy, this can represent a sizable figure. Overall, mining salaries outperform the market average at national level, and are remarkably higher at the local level. Detailed data from both PI and RUL showed that mining paid significantly above market average at the time this research was conducted. It also showed that jobs at the mine are ever more skilled, and remuneration has been increasingly reflecting this by widening the gap between lower and higher grades over the recent commodity boom. In short, while the mainstream approach to impact assessment in mining (typified by GRI 2005) has frequently emphasised the importance of local mining employment, this work shifts the focus to labour productivity and overall remuneration. In particular, while total direct jobs from a single mine will seldom meet local expectations, the recirculation of mining salaries within the economy appeared to have had a remarkable effect in the cases analysed.

Employment during construction follows a different logic. It often involves many thousands of jobs, though for a period of three to four years only. There is rarely enough specialised local labour readily available in these places, and there is normally very limited time for training people. In avoiding the consequences of dismissing a large number of employees during the transition between construction and operation, companies often find it easier to bring in specialised construction workers from elsewhere for a limited period of time. Very large and temporary groups of foreign workers can seriously disturb the local customs and lifestyle, and add to delinquency, the sex trade, proliferation of STDs[91] and so on. A usual response by companies has been to keep these groups of workers separated from the local population as far as possible, in dedicated and even fenced camps. Such was the practice adopted by QMM.

7.2.2 Taxes, royalties, and other direct payments to government

Corporate tax on the income generated by companies was in all cases the largest form of government revenue from mining, followed by royalties, which aim to compensate governments for the depletion of a non-renewable resource (save for mining in Namibia, which was royalty exempt until 2006). Indirect taxation[92] on the repatriation of dividends, custom duties and fuel taxes, and employee taxes retained by companies is another material source of income for central governments. Local duties only represent a small proportion of the total government intake. In spite of current company efforts to increase this ratio, around 11% of the total government

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[91] Sexually transmitted diseases

[92] Indirect taxes are defined here as taxes chargeable to the cost of production or sale of goods and services. According to the UN (2000), they include 1) import and export duties, 2) excise, sales and turnover taxes, 3) real state and land taxes, 4) levies on value added and the employment of labour, 5) motor vehicle, driving-test, license, airport and passport fees, when paid by producers, and 6) the operating surplus of government fiscal monopolies on items such as alcoholic beverages and tobacco.

receipts from QMM are forecasted to flow back to the local and regional level in Madagascar. More extreme is the case of RUL, where virtually all tax payments bypass the local administration and go strait to Windhoek. Similarly, in a highly urbanised country like Australia, administrative organization mean that Perth and Canberra are the sole recipients of tax payments for mining activity in the Pilbara.

Government revenue from mining is determined by the tax regime in each country, but it is also dependant on the price of each commodity at any given point – and evidence shows that it is not only the latter that experiences significant changes over time. During the last twenty years, changes in mining laws worldwide aimed at attracting foreign investment have brought significant amendments to tax provisions. The incidence of mining taxes in total value added plummeted in several mineral economies around the world in the early 1990s (Di Boscio & Humphreys 2004). In some countries, the more capital intensive an industry is, the less tax it tends to pay, given the tendency for capital allowance regimes to favour such investments (Otto 2002). Then again, relative to the size of local and regional economies, the absolute value of local tax payments from large mines can be significant. More recently, high commodity prices encouraged governments to increase their share of the booming mineral wealth, thus once again numerous mining codes changed accordingly around the globe.

For years, academia has looked into the question of optimum taxation (for instance, World Bank 2000, Tilton 2004, Otto et al 2006). A full examination of this concept is beyond the scope of this work, and therefore only a few critical considerations are addressed here (for a detail discussion see ICMM 2009). Investment decisions by companies are based on long term price assumptions, not spot prices. As mining is a highly cyclical industry, long-term price forecasts attempt to capture the expected ups and downs in the cycle. In normal cycles, periods of supra-normal profits are followed by downturns. In addition, margins during booms are typically affected by increases in capital and operating costs. Governments' enticement to increase taxes as the market strengthens has contributed to the fact that, overall, investments in mining have historically underperformed most other industries (Humphreys 2000). A sustainable approach to taxation policy should focus on maximising the present value of the stream of revenues flowing from the mineral sector over time. In countries and regions with vast deposits, this implies putting sufficient incentives in place to ensure the continuity of investment over the long term. Raising taxes above an optimal level is ultimately a trade-off between higher short and mid-term government revenues and the negative effect of soaring costs on investment decisions by companies.

Regarding the local level, the SD model builds on the notion of increasing local accountability (Strongman 1998, Eggert 2001, McMahon and Remy 2002), and so it has come together with the idea of greater government decentralisation. However, whether tax payments are further redistributed to mining localities depends on the administrative structure of each economy. Companies benefit from more revenues flowing back to mining regions, as this would increase living standards locally and reduce the risk of social tensions. In weaker states, companies often have the capacity to influence these decisions, at least partially. QMM joined efforts with the World Bank to increase the revenues flowing back to Fort-Dauphin. This, however, generated concerns around the legitimacy of these interventions among NGOs, and raised questions regarding the boundaries of corporate mandate (e.g. Harbinson 2007). More decentralisation is not always better, and the dilemmas faced by Rio Tinto in the Pilbara provide a useful example. The government in the Pilbara is represented by a number of remote and minuscule administrations largely dependent on mining. Given the difficulties faced by non-mining activities, further devolution would likely mean expanding these bureaucracies beyond sustainable levels. Overall, while the discussion around taxation in underdeveloped mining economies has frequently centred on determining the right share of rent between companies, central, and local governments (for instance Auty 1993, 1997, Ross 2001, 2007, Bryan 2007), the issues emerging from this work instead suggest repositioning the debate around the use of such resources.

7.2.3 The economic opportunities of expanding business linkages

Chapter 2 discussed the relevance that development practitioners have often attributed to the consolidation of business linkages from the mining industry to the rest of the economy (see also UN 2001). It also argued that the potential to develop these linkages changed considerably throughout the industry’s history. In particular, proponents of the SD model have encouraged policymakers to favour strategies for substituting imports with local products and services, and argued that this should become a key feature of the industry's new operating practices (Strongman 1998, World Bank 2000, Eggert 2001, McMahon and Remy 2002, ICMM 2003, 2009b). The empirical evidence introduced here provided insight into the key economic challenges and opportunities associated with the development of upward linkages under this model. This evidence contradicts the above mentioned proposition and concludes that, despite remarkable corporate efforts, the ultimate potential for further substituting imports with goods and services originated at the local level often remains marginal. Apart from an explicit intention to increase the local content of the supply chain, there have not been fundamental changes to the production structure of large mines since the global model of development (see Radetzki 1994) to justify extensive optimism in this regard.

While the value added by local suppliers per unit of output is frequently small compared to other industries (Krugman 1995), investment and employment from established enterprises serving large mines are often substantial relative to other local opportunities (McMahon and Remy 2002). This could vary though, depending on local economic features and, also critically, the stage of development in the life of the mine. The first of such stages is construction, normally encompassing three to four years of intense in-site work, frequently followed by a period to ramp-up production. The majority of the goods and labour required are seldom available locally and is thus often imported. Even for smaller supplies, there is normally limited time to strengthen the local supply-base between the investment decision and the commencement of works. Despite significant groundwork, the construction of QMM found most locals unprepared. Also, efforts at this stage may prove wasteful, as the challenges faced by local businesses supporting construction have limited resemblance to those of later phases. Conversely, a large influx of workers increases aggregated demand and can represent longer-term opportunities for entrepreneurs in sectors like accommodation or catering. Excessive demand, however, may also generate price distortions. This phase is associated with sharp boosts to property transactions, which often fuel inflation. In brief, this period is characterised by a large and sudden increase in the supply of money and thus by indirect business opportunities for some local entrepreneurs. Local difficulty to cope with these economic transformations can also generate disruption and social conflict.

During operation, a detailed look at established mines showed that the value of company purchases is vastly concentrated on a narrow list of products, often topped by the purchase of energy. With differences from mine to mine, energy is followed by mechanical components; large service providers (e.g. mining contractors); tyres for mining trucks; chemicals, explosives, lubricants and gases; repairs and mechanical works. There is still significant value concentrated in smaller items of the supply chain, although the ability of local enterprises to capture it appeared to have been constrained by local conditions. Taking the example of PI, in 2004, less than 10% of this value accrued to companies based in the Pilbara. Rössing showed a similar situation in Namibia, with just one local firm among the top 30 suppliers, which was, in fact, a provider of services (as opposed to manufactures). In very remote mines particularly, the scope for a significant process of import substitution is narrow. Becoming a reliable producer requires competitive advantages and economies of scale of the sort typically missing from these places. Actually, expenditure by employees appeared to have a much more extensive impact on local economies than corporate spend. In 2005, the value of supplies purchased by RUL from Arandis and Swakopmund was equivalent to 1/3 of the salaries and wages of the company's employees living there.

On the other hand, when the focus moves up one geographic level, the economic potential associated to the expansion of the supply chain becomes remarkable. Western Australian businesses benefited enormously not only form Rio Tinto's operations in the Pilbara but also from those of its competitors. Seen as a whole, WA has developed an efficient system of upstream linkages, including high technology mining machinery and equipment, IT systems and specialised mining software, as well as an extensive network of services to mining, spanning from geotechnical, hydrological or mining engineering to most sophisticated environmental services (Mining Journal 2005). For this reason it is often referred to as one of the most successful mining clusters in the world (Eggert 2001). Moreover, contrary to the expenditure pattern seen in Rössing's employees, where most income tends to be spent locally, PI workers living in the Pilbara spend and invest most of their money in

Perth. Mining clusters also provide a safety net to suppliers at the time of mine closure, as their production can be absorbed by other customers. Without this safety net, closing out mining operations has revealed the difficult challenge of minimising damage to suppliers as linkages are suddenly broken. Such was the dilemma faced by Rössing in Aranids.

This research has not considered downstream processing in detail, as potential for local downstream benefits was not identified in any of the three operations studied. At the local level, the development of downstream, or forward, linkages tends to be more difficult than the above referred to backward linkages, in part given that these activities frequently require access to different types of markets, technology, significant levels of capital, and skilled labour, among others. Chapter 2 already explored the economic rational and geographical forces behind the current industry structure as well as the forces for and against vertical integration (Radetzki 1982, 1994; Studwell 2009). An important conclusion from this is that large endowments of natural resources do not necessarily lead to a comparative advantage in the processing of minerals, their refinement or further beneficiation. Evidence has shown that top-down efforts to establish processing plants near the mines have regularly led to value destruction (Krugman 1995, Humphreys 2002, Rio Tinto Economics Department 2007b)

7.2.4 Direct corporate expenditure in the communities

Against the established wisdom that SD would bring the end of a philanthropic approach to community development in mining (Pettifer 1998, Strongman 1998, Eggert 2001, Kunanayagam 2003, Harvey and Brereton 2005), this research found that voluntary corporate expenditure continues to be a critical instrument for community engagement by the corporation. Interestingly, however, there is not one single pattern in the cases analysed. In Namibia, the bulk of community investment by RUL was linked to profits. In essence, the better-off the company, the more investment communities will receive from this source. Conversely, unlike anti-cyclical arrangements, this has meant that periods of economic hardship in the communities due to slowdown in mine production coincided with empty company pockets for palliative measures. In this model, Rössing decentralised community investment (CI) into the Rössing Foundation, which for the most part supported educational programs at the national level, largely disconnected to mining. More recently, the Foundation re-focussed its initiatives to address potential closure, effectively spending more money locally (RF website). In Australia, instead, community expenditure by PI has primarily aimed at compensating Aboriginal people near the mines. The scale of this contribution was considerable: the Pilbara region receives the largest share of Rio Tinto community investment worldwide, even when measured relative to the size of the operations (Rio Tinto 2006). All other types of economic opportunities from mining have mostly circumvented the Aboriginal economies. Ruled by carefully negotiated arrangements, these contributions could be seen as another form of tax.

A number of lessons emerging from the studies are worth reflecting upon. A first point relates to scale. Even adjusting for items that could be accounted for as part of operating costs, like training programs, CI is considerable in absolute terms; that is, it represents a major source of income for those directly targeted by the community programs. However, when seen relative to the value of inputs into production (particularly salaries, but also payments to suppliers), they are in fact insignificant. This conclusion is consistent with recent findings by Zandvliet and Anderson (2009). Second is the fact that, as described, these contributions are largely detached from the production processes of mining companies. While they came from mining companies in these cases, they would have arguably had the same effect if they had come from other industries – or in fact any other donor. This research has provided details on the drivers and motivations behind each of these agreements, both from the companies and communities points of view. Whether or not these flows of cash can promote economic activity in line with the principles of SD appear to depend more on the uses that these payments are put to, rather than on the deal each community was able to strike.

At the other end of the spectrum, from the outset, QMM's community engagement strategy focussed on agreeing a clear division of accountabilities with the other local stakeholders (Rio Tinto 2007). Direct company responsibilities would encompass economic opportunities flowing from mining activities principally, like training programs, or efforts aimed at expanding the local supply chain. The focus has been less on philanthropic contributions and more on business-driven opportunities. There has also been recognition of the limits of these opportunities, particularly during the construction phase of the mine. Thus, a second tier of work focussed on attracting other institutions to help where mining companies lacked direct expertise. In these cases QMM would only act in partnership with others. Finally, a third tier of work determined a number of no-go areas for the company, perceived to be clearly beyond its mandate. Here, corporate efforts would centre on leveraging capital and further contributions from third parties like donors or NGOs. QMM broke the mould and embraced this challenge by using its unique institutional leverage. This was, probably, the most innovative feature coming from Rio Tinto's strategy in Madagascar – but it has also been its main source of criticism.

7.3. The local economies

This discussion has indicated that, while mining has often provided a unique economic stimulus, the local populations have not always managed to take full advantage. In particular, while some groups benefited considerably from it, others missed out notoriously. As argued above, some of the reasons explaining this pattern go back to the very nature of mining, and are thus applicable to all local mining economies. However, a number of distinctive economic limitations affecting each of the different localities covered in this research can only be explained by their unique characteristics, these being geographic, cultural or political. In other words, despite the universality of a set of questions involving mining and its surrounding communities, preconditions have determined socioeconomic outcomes to a significant extent.

7.3.1 Geography, economic interaction and social exclusion

Broadly, in the cases analysed, general socioeconomic conditions around the mine do not appear radically dissociated from country trends, and hence these local communities can only be understood within their national contexts. For example, social exclusion and poverty in the Pilbara region is characteristic of remote Aboriginal economies in Australia (Altman 2001, Taylor and Scambary 2005). Yet, significant differences in the type of interaction between the operations and the local economies led to different outcomes. On the whole, where direct interaction was greater (namely, where there was evidence of local reliance on (i) direct mining salaries, (ii) the demand for local supplies, or (iii) community investment that was linked to corporate performance), the impact from changes in the company's input factors was larger. This, in fact, applied both for periods of corporate bonanza as well as duress. For example, the economy of Swakopmund grew enormously after RUL's inception; then, a large downsizing at the beginning of the 1990s caused significant economic contraction locally. Interestingly, after a decade of economic expansion and diversification, the second big retrenchment at RUL did not affect Swakopmund much.

Strong direct ties to an operation become a liability when the life of a mine is presumed to be soon coming to an end, as was the case in Arandis. Instead, these ties turn into an opportunity when mining has a long term horizon – either because the mineral deposit in question is vast enough, or because of the presence of a mining cluster, like in the Pilbara region (The Mining Journal 2005). Direct interaction between the operation and the pre-existing local economy was minimal in the case of Pilbara Iron though, and changes in input factors at the mine did not show in the neighbouring Aboriginal communities at all (URS 2005). The amount of native people employed by the mine remained negligible in relative terms, as was the participation of Aboriginal businesses in the local supply chain (Taylor and Scambary 2005). This seeming economic independence was not the result of successful economic diversification in these communities but rather evidence of their complete segregation from formal business activities. As discussed, even community expenditure by the company was negotiated and agreed on separately for the most part, and contrary to the case of Rössing, it was set at a fixed value from the beginning, completely uncorrelated to measures of company performance like profits or others (PI 2005, Rio Tinto TS 2005)

Particularly regarding the economic interactions within different business activities, this research has already discussed that in mining, the development of upstream and downstream linkages locally can follow a fundamentally different pattern to those which are present at the regional level (for instance, Acil Tasman 2005). We have seen how the mining industry in WA has well-developed linkages from and to the rest of the economy, although this does not hold locally. Remoteness, cultural barriers, scale economics, or the lack of reliable transport or communications infrastructure, further restrain the expansion of the local supply chain and other business networks. Notably, in well-established operations, the vast majority of supplies imported into the region still came from either the same country or bordering nations, and so most benefits from these purchases stay relatively close by. For example, 74% of RUL's imported goods and services are in fact supplied by the well-developed South African mining sector. For the most part, PI relies on Australian goods and services.

In one case, Swakopmund, there was strong evidence of successful economic diversification. Diversification here was driven by clear comparative advantages alternative to mining, as discussed, although it was also underpinned by reinvestment of mineworkers' income in the local construction sector. Indeed, a booming housing market, together with the emergence of a large pocket of high earners (made up of both mineworkers and a group of well-off seasonal European migrants), became the pillar on which a strong local financial market consolidated. This development cannot be seen as the norm in local mineral economies though, as serious deficiencies in local capital markets were identified in all other cases. In general, some crucial features of remote and small economies can prevent local credit activities from expanding. Many of these economies remain scarcely monetised[93], staying as cash economies in a great proportion. Cash[94] is not transformed into bank deposits; it is stored instead by fragmented groups of people, and cannot be captured and re-injected to finance economic development. In small and remote towns like Arandis, Fort-Dauphin or those in the Pilbara, sociological constraints often add to geographical constraints, and banks tend to limit their clientele to confined segments of the surrounding population, normally to the detriment of small and medium borrowers (Martin 1994, Martin and Klagge 2005).

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[93] Monetisation is referred to as the transformation of cash into bank deposits.
[94] Cash refers to the currency that is in the public domain and circulating and not that deposited in banks.

In all cases, the local reinvestment of salaries was the principal contributor to increases in the demand for local goods, services and, notably, property. This demand had positive and significant economic implications for local businesses, which witnessed a major increase in the amount of cash circulating in the economies. As a consequence, and together with the other direct contributions discussed above, the three mines analysed have ignited processes of considerable wealth accumulation. This accumulation has benefited either the local or regional economies greatly, depending on the ability of each community, or sub-community, to attract some of that wealth for reinvestment. The dichotomy between Arandis, the small mining town home to low skilled workers, and Swakopmund, is one example. The tension between the Pilbara region and Perth is another.

On the other hand, and despite the importance of mining salaries to the economy, locals resent that mining often exacerbates income disparities. Labour compensations from the companies have pushed employees and other direct beneficiaries from mining into the highest earning brackets of these societies. Zandvliet and Anderson (2009) argue that the concept of fairness is locally determined and necessarily context-specific. In these cases, the arrival of high income earners and the sudden consolidation of groups of people significantly wealthier than the average has been associated with some degree of local resentment, and has generated (or exacerbated) social tensions due to raising inequality. These changes have also been linked to the above mentioned local inflationary processes, often led by the local real estate market, which can be frequently traced back to the construction of the mines. Overall, the arrival of large mining operations has inflicted changes to pre-existing social and power structures. The conflicts manifested by either segregated Aboriginal people in the Pilbara, or displaced local residents in Fort-Dauphin, serve as illustration.

To sum up, specific local characteristics have determined the type of economic stimulus from mining that each economy is more likely to capitalise from. A first group of economies (or sub-economies) may remain largely detached from the influence of large mines. On the one hand, this group can considerably reduce exposure to the inherent volatility of commodity cycles; on the other, they often fail to exert tangible benefits from mining altogether (Altman 2001). In a second group, the better the performance of the mine, the greater the direct benefits captured by the local economies. This is the case when business links between the mine and economy are strongest, or when contributions from the mine are related to business performance, as often tax payments are, or sometimes community expenditure. However, a growing dependence on a single company can represent a threat to the long-term economic viability of these places. Over-reliance on direct benefits brings in other issues. This work identified a number of local situations that fit well with what the literature calls rent-seeking behaviours, understood as the efforts by groups of individuals to capture a larger share of the existing wealth (Krueger 1974, among many others). This literature has claimed that this phenomenon may accentuate local income disparities and social tensions, which have also taken place in the cases analysed.

Yet, in a third group, an initial investment push from mining can help consolidate local economies by specialising in sectors others than mining. This research has referred to this group as successful diversification. In these case studies, increased disparity has mostly been the consequence of the emergence of new pockets of wealth, which in turn increased the circulation of cash within the economies, and in some cases improved local conditions more broadly. In particular, this study found that local diversification and growth has occurred principally where some economic potential outside mining pre-existed, including basic fundamentals such as a minimum economic scale. In these situations, the economic incentives that give rise to rent-seeking behaviour can be minimised. The findings from this study are, therefore, more closely aligned with the literature claiming that nothing intrinsic in mining should prevent mineral income from being re-invested in other forms of capital to promote longer term economic development (Rodriguez and Sachs 1999, Sachs and Warner 1999; Humphreys 2000b; Davis and Tilton 2002, 2005; Czelousta and Write 2003, Sachs 2008). Once again, the use to which mining revenues are put to comes to the fore.

7.3.2 (Sustainable) policy responses

In general, when there have been suboptimal economic performances, responses by the companies have tended to narrow the policy spectrum and focus on those challenges most critical in each place. In contrast to previous practice, for the most part, the companies defined priorities in consultation with local communities, which is strongly consistent with the key SD attributes highlighted by the mining literature (Strongman 1998, Eggert 2001, Humphreys 2002). Moreover, in fact, local and regional governments have taken the leading role in setting up these priorities. In the Pilbara region, for example, the State government of Western Australia left PI little option but to endorse the official vision of 'Strong and Sustainable Local Communities' (Pilbara Development Commission 2005), even when the State itself had so far failed to secure the economic sustainability of Aboriginal communities, still relying heavily on government handouts. The sheer magnitude of this mining operation has put PI under a permanent spotlight, and thus every policy decision taken with regards to its expansion plans has been influenced by this overarching goal. In the case of Arandis, in Namibia, it was the federal government directly who pressured RUL to assume long lasting responsibility for the economic survival of this unlikely town in the event of closure. As with PI, this unequivocal government definition has become the foundation for every deliberation around closure ever since.

One new focus area of corporate policy has taken on the task of soothing the effect of negative economic externalities from the operations. One example is the previously mentioned worsening of the distribution of income that can take place around the mines. In the absence of thorough local development strategies, corporate responses have generally aimed at facilitating local access to the direct economic opportunities by the company, and have thus attempted to improve the ability of locals to provide goods, services and labour, for instance, by underpinning small suppliers or by supporting local employability with training programs. We have seen that in practice, and contrary to claims from SD advocates (Pettifer 1998, Strongman 1998, McMahon and Remy 2002, Harvey and Brereton 2005), limits to what companies can effectively do to materially expand the local supply chain and improve local employment trends meant that these responses have been complemented by discretionary community investment to a large extent. Yet, the volatility evidenced in the value of mine inputs throughout the years has been such that most direct interventions could only affect these trends marginally – with the exception of QMM.

QMM adopted a different approach altogether. Chapter six explained why intrinsic to this project was the requirement to attract investment in complementary sectors and to consolidate productivity gains for the broader economy. As part of this task, QMM took on the challenge of coordinating positive economic externalities. A key component of this challenge was to establish a new local economic institution that could bring about regional consensus as well as greater capability for local coordination (Dobbin 2006). This focus implied engaging in areas of work that have been so far beyond mining companies, and adopting roles different from the ones they typically played in the past. Among others, a change in the skills-base of the company became imperative. Local economic development practitioners, for example, or development economists with experience in dealing with the World Bank and other multilateral organisations were brought onboard. In its attempt to mobilise endogenous forces in the local economy, QMM managed to generate an innovative space for interaction with the participation of the private and public sectors and the community. This new space for dialogue resulted in the adoption of a local development blueprint that was to guide policy making initiatives in the transition period lying ahead (Dobbin 2004, PGRM 2006)

The interpretations of sustainable development adopted by the corporations as well as the local governments and the communities, have in all cases conditioned the policy strategies finally put forward by the companies. One way or another, PI and RUL have resorted to palliative measures to counteract the negative implications of their presence – or those that could have came up from their withdrawal, in the case of Namibia. While well-intended efforts by PI and RUL have been largely predefined by a policy context that was dated many years back in time, QMM's radical shift in approach was not conditioned by policy decisions made before the times of sustainable development. In this sense, Rio Tinto's operation in Madagascar may be considered a pure example of a mine working under the premises of the SD model (Clifford 2004). Furthermore, QMM's attempts to favour bottom-up institutions, human capital development, the local appropriation of positive externalities, the coordination of local economic agents and so forth, have been most reminiscent of the propositions often made by endogenous growth theorists. To bring attention back to this link is the purpose of the next section.

7.4. Building on theory: mining, regions and SD

7.4.1 Pre-empting the emergence of a new mining orthodoxy

Chapter 2 explained that the different responses to issues of economic and community development by mining companies have typically been driven by changes in the fundamentals of the industry over time – including the evolution of social expectations. The sustainable development model in mining is the latest of these identified responses. While the concept of SD had been elsewhere consolidating for years, mining had largely remained oblivious to its message, resigned to the portrayal that epitomised it as the antithesis of this concept. Towards the end of the last millennium, and partially in response to high-profile external pressure, the sector made a 'U' turn and vigorously embraced the key principles from this movement, and adapted them to the unique nature of mining (MMSD 2002).

Rio Tinto was going to play a key role in this process. A rapidly degrading reputation that bottomed during the dramatic events in Bougainville described in chapter 3 represented a loud wake up call for change. To a large extent, the mistakes of the past have paved the way for this new approach, and a process of corporate learning was set off. Lessons from the experience of individual operations started to feed into the design of new corporate standards and procedures and underpinned a radical shift in the culture of Rio Tinto and also that of the mining sector more broadly. The industry's rhetoric changed accordingly. A vast number of social programs and community projects targeting new industry priorities were put in place. In turn, the human resources profile of large companies started to adjust, reflecting the new need for community practitioners, anthropologists, and many others (ICMM 2003, Prescott 2009, Anglo American, BHPB and Rio Tinto websites). As such, SD brought with it a renewed set of policy recommendations and a breath of fresh air to the mining industry.

Thus, in a short period of time, the so-called SD model of mining and development filtered down into every level of corporate decision making and a legion of new propositions became part of the industry's daily reality. These included, for instance, a conviction that benefits from mining should concentrate at the local level, as it is here where the industry's worst legacy has taken place; that sustainable mining must lead to flourishing and diversified local economies; that local procurement, therefore, ought to be prioritised; or that dedicated mining towns are intrinsically bad for community and economic development – and that FIFO (fly-in and fly-out) practices are perhaps worst (for example, WBEIR 2003). As highlighted by this research, so established are such propositions that they are hardly contentious these days. This is a shame: with all the positive changes accomplished by the SD movement, it may have also brought with it, as it happens, a renewed set of unchallenged beliefs that has contributed to the formation of a new policy orthodoxy in mining, not always underpinned by rigorous analysis.

One such belief is that manufacturing and services are better for the local economies than mining, and should thus be encouraged (WBEIR 2003). This resonates strongly with the propositions made earlier by the theorists of the dual economy analysis (Prebisch 1950, Rostow 1952, Sunkel 1989, Cueva 1993). However, accelerating a move towards increased manufacturing production and services would be partially served by policy objectives focussing on increasing the accumulation of physical and human capital – which is precisely what mining proved to do in some of the economies analysed, the most salient example being Rössing's Swakopmund. In this sense, initial production concentration in one economic sector can be justified by substantial capital accumulation. Additionally, earlier this chapter argued that improvements in the productivity of the main economic sector locally can sometimes be transferred to other sectors. This way, changes in mining productivity from investment in technology, skilled human capital or better managerial practices, can sometimes spill-over and help improve local productivity more broadly. Yet, these case studies also showed that the higher the starting level of human and physical capital, the higher the potential for local absorption. If the initial stock of human capital is below a certain threshold, for instance, the economy can become stuck in a resource trap, where most local skills are devoted to the extractive sector – or otherwise imported. The Pilbara region provided a good example of this.

For these reasons, this research has suggested that asking how local resource economies can diversify towards other sectors may be a misleading question. First, it should be established whether such diversification is desirable. Many of these places are remote and small, and lack the necessary economies of scale. When economic diversification is not natural, there is a chance that it should not be desirable, even if circumstantially attainable through dirigisme from either the public or corporate sector. For example, at the national level, centralised efforts to diversify from natural resources led to the widely-discredited venture into import-substitution industrialisation (ISI) in most of Latin America (Hadass and Williamson 2001). In much the same way, economic fundamentals had decided the post-closure fate of Arandis even before its construction started: a remote and small mining-town without a mine, in the middle of the Namib Desert, would not be able to live up to the legacy that Rio Tinto now promotes for its communities. As with other mining towns elsewhere in the world, Arandis was built to be dismantled after mining came to an end. The essence of the dilemma faced by Rössing was not how to turn Arandis into a sustainable economy, which today appears to be largely unattainable, but rather how to live with a decision that was made back in the 1970s, and that nowadays appears to be antagonistic to what has come to be expected of a large mining house embracing sustainable development.

This discussion points out the importance of avoiding blanket responses to these dilemmas and founding policy strategies on sound and dispassionate diagnostics. In those cases where legitimate economic opportunities can be identified at the community level, efforts to expand the local economy may indeed deliver results. If that is the case, policymaking should endeavour to maximise economic impacts locally. Instead, when non-mining economic activities would likely not outlive mining, efforts should be better directed at minimising local impacts from day one. In these cases, policymakers would be better advised to focus on maximising mining economic linkages at the regional, or even national, level. This study also showed that there may be cases in which extensive mineral resources underpin the establishment of mining clusters, turning an inherently finite economic activity into one with a very long term horizon. In the case studies undertaken, this research has encountered all these situations. However, in all cases too, local interpretations of SD have predefined a strong set of expectations, not always realistic, which in turn have conditioned the policy strategies ultimately pursued.

7.4.2 The materialization of an innovative approach

In brief, this paper has argued that local economic expansion should not be pursued at any cost. In some cases, as discussed above, basic economic fundamentals will not be in place. Minimising, as opposed to maximising impact, may sometimes be a better strategy. In the other cases, however, the realisation of this economic potential has often been constricted by sub-optimal, although at times fixable, local conditions. Where these conditions occur, proactive responses may be necessary. From the analyses in this work, these conditions could be summarised as follows:

- *Lack of infrastructure and leading technologies.* In poor and isolated places, harsh economic pre-conditions may result in a poverty trap, where income cannot be reinvested in the first place. Sachs (2008) identifies four priority areas: modern infrastructure, including transport, electricity, and telecoms; educational infrastructure; health care technologies of all sorts; and high-yield agriculture technologies, including small scale irrigation, fertilizers, or improved seed varieties

- *Lack of broader local and regional development plans*. Some mineral economies have tended to rely excessively on the wealth generated by mining. In cases, capital and labour may even shift from traditional activities to a booming mineral sector. In the absence of comprehensive development strategies, this situation could create significant distortions once the resource boom has passed

- *Lack of institutional or administrative capacity*. Inadequate institutions as well as skills and expertise can mean that the full range of opportunities flowing from major projects is not always realised. The challenges associated with managing large extractive operations are nowhere near those otherwise faced by these economies

These have recently been capturing the attention of the academia more generally, and are now starting to be looked at in the light of new development theory more broadly. To recapitulate, chapter 1 explored how, in thinking about economic growth, growth theorists had initially overlooked the role of technological and productivity change, as well as the level of education and skills available in a given economy – partly because these had been assumed to be extensively driven by exogenous forces. However, while still a factor, exogenous forces could not fully explain the divergent performances of seemingly comparable economies. Evidence later showed that technological breakthroughs, the adoption of new technologies, the quality of human capital, managerial practices, and productivity growth more generally, could actually be explained endogenously to a large extent (Romer 1986, Lucas 1988, Barro 1991, Grossman and Helpman 1991). This suggested a change in approach to economic growth from one largely focused on capital accumulation to one that also considered the ability of local economies to increase aggregated factor productivity by capturing the positive externalities arising from the investments of different economic players as well as from their interactions (Pack 1996).

The issue of local coordination and economic institutions hence acquired striking importance. At this time, it became clearer that different structures of economic governance, and different ways of organising the human capital locally, were influencing growth outcomes too. This gave rise to Institutional Economics, which has been consolidating since as a mainstream field of academic work. Numerous empirical analyses then linked underdevelopment with institutional failure, but have also suggested that there could not be blanket solutions (Bates 2001, North 2001, Acemoglu 2003, Rodrik et al 2002, Rodrik 2003, 2004). Existing institutional arrangements are the result of historical conditions and cultural beliefs; rather than pursuing optimal configurations, policymakers should aim at understanding the possible institutional constructs that are most conducive to sustainable growth in each circumstance. Institutional economists have also argued that proximity and the resulting potential for more frequent interactions means that sub-national institutions are better suited to deal with the challenges of local economic development than central organisations are, and have thus diverted attention to better understanding different possible forms of local governance (Pratt and Toterdill 1992, Amin and Thomas 1996, Acemoglu 2003)

More particularly, building on Vazquez Barquero (1999), chapter 1 also explored the characteristics of the most successful non-mining experiences of Local Economic

Development, and described how these have been frequently structured around three pillars – which essentially tackle the sub-optimal conditions for mining economies described above: (i) the provision of infrastructure, which poor quality is largely seen as a cause of market failure that prevents supply and demand forces to meet, meaning that some enterprises that would otherwise be feasible will seldom be developed; (ii) the consolidation of a comprehensive mid and long-term development strategy to enable local and regional communities fulfil their economic potential; and, (iii) the implementation of this strategy into action and the management and coordination of the multiple elements involved. While some key players in these economies have often catalysed the emergence of different regional economic policies, it is critical that these policies are ultimately appropriated by the majority of the local society (Storper 1997, Rodriguez-Pose and Arbix 2001, Rodriguez-Pose mimeo)

The study of QMM in Madagascar provided a detailed exploration of how some mining companies are responding to these same challenges by assuming a proactive role in order to help fill the financial gap that affects the development of essential infrastructure and the adoption of basic technologies; facilitate the formulation and implementation of development plans that look beyond mining; and address the need to develop human capital and to build institutional capacity at sub-national levels capable of coordinating the strategic objectives of both the company and region. QMM was under construction at the time of this analysis: it will be necessary to revisit this study once the mine has been in operation for several years and more tangible indicators could be considered. However, while mining activities have long been ignored as potential triggers of local and regional sustainable development, the approach and experience of QMM thus far suggests that large mining enterprises, under certain circumstances, can become one of the key catalytic players described by Vazquez Barquero (1999); can nurture strong synergies between the mine and region; and can thus help set an endogenous growth process into motion.

This conclusion distances itself radically from previous mining wisdom. On the one hand, scholars of the endogenous growth theory have argued that different types of investments held different development potentials (Pack 1994). This work already discussed that while mining contributed significantly towards local capital accumulation in the cases analysed, its ability to sustain increases in total factor productivity outside of the company's perimeters would be closely related to the starting point of human capital, managerial capacity, and the technological stage in the wider economy. On the other hand, however, QMM's chief contribution in this regard has arguably been on the institutional front, beyond mining production strictly speaking. This contribution has been in line with a call for the active coordination of local governance made by some theorists (Martin 1990), in particular the suggestion that players others than government could legitimately fill a local void and play a critical part in economic development planning and the building up of innovative institutional frameworks more conducive to long-term development (Peck and Tickell 1994, Amin and Thomas 1996, Acemoglu et al 2003). As this case study has shown, these may consist of formal and informal systems of governance, including development agencies, foundations, cooperatives, consultative processes, industry associations and others.

The QMM trajectory will hardly become the default outcome in mining however, and this research has also emphasized the intrinsic complexity of this approach. The mining industry resolutely addressing economic development challenges signals a departure from business as usual for both companies and development organisations. For companies, this means venturing into a field previously kept exclusively for governments and development specialist groups. For development organisations, this means accepting that large extractive enterprises are not necessarily the problem, and that they can indeed be part of the solution. For many, this proposition is still not easy to digest (WBEIR 2003). First is the question of mandate, and the condition to accept that a private company can and should step into public policy making. So far, this has been seen as an invasion of government sovereignty. Indeed, QMM has been less attacked for the type of economic development approach adopted than for the fact that it has aggressively adopted an economic development approach (Harbinson 2007). Next is the issue of expertise: while large companies frequently excel in management and organisational capacity, so far they have rarely applied these attributes to the science of economic development. This work already praised the adaptation capacity shown by QMM in this regard, although advancing this approach systematically would require a far-reaching revamp of the skill-base of mining companies more generally.

Venturing into these new waters alone could be a risky enterprise. Mining companies have chosen to address the multifaceted issues of development by working together with specialised organisations. While this is clearly not a new approach in mining, most of these associations had so far focussed on environmental and social issues, and only recently have they expanded to deal with broader economic development. Most notably, QMM has gone as far as to establish a formal partnership with the World Bank, among others. Aligning and coordinating the immediate interests of most local players with the newly perceived requirements of long term economic growth should probably be counted as the fundamental achievement of this story. In particular, key players like the World Bank or other multilateral organisations can add greater value by adopting a role complementary to that of the private sector. With all the virtues of this approach, however, the case of QMM has also pointed out to the risk that once agreements are reached, the momentum will dissipate. The experience of Rio Tinto in Madagascar shows that it is important that all players remain fully involved throughout the life of the project and that they maintain a focus on implementation.

7.5. Closing the circle – and the way forward

Large mining enterprises have changed operating practices radically under the so-called SD model. Admittedly, the case studies in this work have not provided a comparison of hard data between companies functioning under the SD model and previous models of mining development; the industry has simply changed too much from those days, and it is virtually impossible to find large corporations in the industry not claiming to operate under SD premises in one way or another. For that reason, this work looked into the way in which three mainstream enterprises approached different issues related to sustainable economic development at distinct stages in the life of a mine. The evidence discussed in this work showed that these new practices are more closely aligned with the principles of modern local and regional development theory than was evident in previous models. As such, a fundamental conclusion from this work is that these enterprises can, in cases, become catalysers for economic development at the local and regional level, and can thus help trigger processes of long lasting economic development. This conclusion, however, is not free of caveats, challenges or controversies.

To start with, this conclusion also implies that there are cases in which these beneficial effects will not come about. We have seen that new mining practices have in cases promoted unattainable economic expectations at the local level, and have set blanket targets hastily accredited as part of sustainable development principles. This has often responded to a basic misalignment between the fundamental features of mining economies and the policy framework that rules these economies. There is a strong case to step back and dispassionately consider, in each situation, whether efforts to discourage local economic expansion could not be in fact more beneficial. For those other cases where mining activities could indeed strengthen local economies in a sustainable way, we have discussed in detail examples of recent corporate work around local supply development; human capital development; the flow and use of tax payments; focussed community investment and further local economic initiatives. Yet, this work has also suggested that the most critical contribution from these enterprises may arise, in fact, from their managerial capability and convening authority, in particular as these features could be applied outside of their immediate corporate remit. Some of these companies have reinvented themselves as coordinators of broader economic development. They have identified an institutional vacuum in the economic milieu of remote and small localities facing the prospects of a mineral boom, and some of these enterprises are now moving in to fill that void.

Whether this approach is successful would depend less on the mining practices of these companies than it would on the characteristics and merits of the development programs they put forward (in addition, of course, to all relevant external factors). The experience of Rio Tinto has shown that, in some cases, these programs could be in line with the key concepts and recommendations embraced by modern development theory, particularly those proposed by the Local Economic Development movement. To a large extent, the key features of the markets and technologies involved in the extraction and processing of minerals have not changed dramatically over the past two decades; rather, global sentiments reflecting new social expectations for the mining industry galvanised the propositions put forward by this new movement. While the economic push from mining activities has remained very relevant to these places, the policy focus has been gradually moving towards the longer term re-investment of this capital. In that sense, the key factor of this development agenda has been the institutional role that some of these companies now dare to play. This also implies, however, that any organisation clear about the merits and intricacies of this agenda could, in effect, play a similar role. Apart from the fact that mining companies are often the only large players in remote and deprived local economies, there is little in this latter approach that should be seen as entirely exclusive to mining.

7.5.1 Is corporate-driven economic sustainability sustainable?

This work has documented how well intentioned companies have sometimes made decisions that were, arguably, not sustainable from an economic point of view. Rio Tinto's policies to support the economic expansion of remote and fragile towns in the Pilbara region, or Arandis, in the Namib Desert, are examples of these. This corporate stance, in any case, appeared to have been closely aligned with the immediate expectations of most local stakeholders, and was in part a reaction to the external pressures discussed in the previous paragraph. On the other hand, when the company adopted what has been depicted here as the soundest and most innovative approach to local economic development, like that in Madagascar, the company met fierce resistance. What external audiences expect from large operators may not necessarily be the most appropriate policy response from an economic development viewpoint. If this new mining agenda has been driven by the immediate expectations of local stakeholders, what guarantees can be there that companies will continue to pursue what appears to be a rather controversial path? Or, to put is differently, is there a strong business rationale behind this approach?

One possible way to look at this is through the lens of potential reductions in capital expenditure. This approach helped QMM leverage some financial contribution from donors against the cost of a multipurpose port. Relative to the overall project cost, however, this was still a very small contribution. Another way to look at this is in the light of perceived country risk and overall corporate risk reduction, which may have even larger financial implications for companies. The increasing exhaustion of mineral deposits in the industrialised world has been redirecting investment to developing countries during the latest commodity boom (Crowson 2003, Humphreys 2007). This shift in the industry's centre of gravity will increase its risk profile accordingly. If a company's involvement in economic development could reduce the likelihood of certain socioeconomic crises taking place this should conceivably be reflected in the discount rate applicable to projects during the financial evaluation process, thus effectively improving its economics. There is negligible empirical evidence for this link in the literature, however, besides the usual claim that such an approach enhances 'the social licence to operate'. A tangible link between new economic development practices and project value would encourage corporations to take this embryonic expertise to the next level. Thus, the whole concept of mining and sustainable development would benefit greatly from more business-focussed investigations into this field.

In due course, the critical lessons coming up from the three case studies covered in this research would need to be revisited and confronted over time. In particular, future research should investigate whether the innovative approach adopted by QMM during its design phase was sustained after construction; whether the non-mining stakeholders maintained their involvement during operation, and whether or not the promised results materialised in the end. Finally, this research has focussed almost exclusively on the economic aspects of mining and sustainable development. This field of work has been rather neglected by the literature thus far, as the attention has been on other aspects of this agenda, such as the impact of large mines on ecological systems, among others. Future work will need to bring all these elements together and to advance the notion of net impact on the surroundings of large mines, in recognition that a number of trade-offs between positive and negative impacts are de facto taking place already.

7.6. Final remarks

With the unprecedented surge in the prices of minerals and metals since the early 2000s, the emphasis of the industry shifted from cost cutting to output maximisation. Mainstream mining corporations thus ventured into more risky geographies and exploration in developing regions increased dramatically. The ability to successfully deliver new projects in more challenging environments became increasingly important. At the core of these changes was a drive to facilitate legal access to resources and relationships with local governments and communities. While the literature had concentrated on the macroeconomic implications of mining – including issues of price volatility, government revenue fluctuations, foreign exchange movements, trade balance and so on –, the latest commodity cycle brought with it the consolidation of the SD movement, and with it a focus on the most localised aspects of development. Underpinned by the sharpest commodity boom in records, attention then shifted to issues such as the distribution of mineral wealth, local institutional capacity, or the availability of local skills (World Bank 2002).

A cautionary note should be introduced here. An increased presence of large mining investments in developing regions also meant that some of these projects will represent a larger than usual share of GDP – with all the potentials and challenges that that entails. One such challenge would be the detrimental effect of a commodity crash on these countries. Indeed, as this research came to a conclusion, analysts had declared the end of the bull market; commodity prices had sharply fallen off their peak, and the financial health of several top mining houses – including Rio Tinto – had been deeply affected by the worldwide economic slowdown that followed the Global Credit Crunch that started in late 2007. As companies slash expenditure across the board once again, it remains to be seen whether and how the end of this cycle will change the corporate incentives to respond to the questions addressed in this analysis. One possible outcome could be that changing priorities in fragile mining states sways attention away from local pressures. This seems unlikely though, as most of the other drivers that contributed to the emergence of SD in mining are still in place (Covalence 2009). In any case, this too may be the substance of future research.

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Chapter 8

Summary and conclusions

The literature on economic development is flooded with claims that the abundance of natural resources retards rather than accelerates growth, and has often concluded that mining should be avoided as a development strategy. These claims have not gone uncontested though, and the continuous surfacing of new empirical evidence has all but brought this debate to a conclusion. Lately, however, a timid consensus has started to materialize. This consensus has acknowledged that, rather than being either positive or negative, mining has in some circumstances been a constructive force for development while in others it has not – and has called for thorough case studies to explore this proposition. This repositioning of the debate was facilitated by the emergence of a new economic development framework more broadly, epitomised by the Endogenous Growth Theory and the consolidation of Institutional Economics as a mainstream field of research. More particularly, this work looked at whether the lessons from Local Economic Development (LED), a school of thought flowing from this theoretical turnaround, could be applied to mining more generally. While mining may have been prematurely disregarded as intrinsically incompatible with this new thinking, changes in the structure of the industry had in fact started to shape this debate long time ago.

Three distinctive stages could be singled out throughout history. In the first one, most mineral ventures were relatively small and aimed at satisfying regional demand. Equipment was not particularly sophisticated, and thus capital requirements were relatively low. In turn, labour inputs were proportionally much higher than today. Local beneficiation was supported by high transportation costs, and by the simplicity of goods required during the process. Similarly, it made more sense to ship high-value semi-finished or finished products than ore. Then, the mine not only satisfied the need for minerals locally but also became a regional pole of development. Overall, economic benefits from mining were assumed to take place naturally. In the second stage, transportation costs had fallen drastically, allowing mines to develop far from processing plants and final consumers. Mining equipment was now sophisticated and specialised and, with lower transportation costs, local suppliers could not compete with global manufacturers. These mines were now huge, complex, and capital-intensive. Regional infrastructure was exclusively motivated by the needs of the mine. Little of the fiscal revenue from mining went back to the regions, which bore most of the negative consequences of mining. When problems arose, the response by the industry was to directly compensate those most affected. This model was characterised by a paternalistic approach to local communities.

As the increasing regional distress in mineral economies was noted by the international community, pressure on corporations started to mount. The deep changes in the industry that followed were chiefly triggered by social demand to improve operating standards. While public pressure concentrated on the environmental and social dimensions first, the focus gradually shifted towards the economy. This pressure led to a number of reactions by the industry aimed at rectifying this situation and enhancing the visible contributions of mining to affected communities, which has since been referred to as the sustainable development (SD) model of mining. This model incorporated some key policy lessons from the new development movements mentioned above, and proposed governance and operating practices in which, for example, negotiations and agreements would include communities and regional authorities; the central government would share tax revenues with regional administrations; compensations would be negotiated with the broader community, and infrastructure development would aim at addressing both the requirements of the mine as well as the broader economy. This model shifted the policy focus from the national to the local level.

This research has focussed on the economic aspects of this agenda, and to some extent accepted man-made capital as a surrogate for natural capital. In particular, it has asked whether mining enterprises under SD can help transform finite mineral resources into long-term sources of development and catalyse economic growth around the mines. In exploring these questions, it has dug into the experience of Rio Tinto, one of the largest mining corporations in the world, which has also been instrumental in setting the SD agenda for mining more generally. Three case studies were developed, covering the most distinctive phases in the life of a mine. The first one looked at a uranium operation facing the prospect of early closure in the Erongo region, Namibia. The second case explored an expanding network of iron-ore mines in the remote Pilbara region of Western Australia, and reviewed the economic opportunities associated with a mining cluster. The final study covered the design and inception phase of a mine, and considered the innovative approach adopted by Rio Tinto's ilmenite business in Fort Dauphin, southeast Madagascar. In all cases, the studies looked at the direct economic contributions from these enterprises but, more critically, they also focussed on the interface between the mines and the broader economies. The studies unveiled similarities, but also remarkable differences.

One component of this work looked at the streams of cash in-and-out of these communities in detail. Consistent with claims by mining and SD advocates, this analysis confirms the frequently striking importance of large mining operations to local and regional economies. This has been particularly true during the recent commodity boom, where extraordinary amounts of cash were poured into these places. However, this work has disagreed with the emphasis attributed to each stream of benefits. While mining literature has stressed the importance of mining jobs for locals, it has often disregarded their potential to increase the productivity of the economy more broadly, and underestimated the economic effect of their remuneration; while it has focused on the distribution of the mineral rent, it has largely overlooked what has been done, or could be done, with these funds. As such, this work shifted attention to the local reinvestment of this capital; the economic opportunities beyond mining; the management of local resources; and the interaction among various economic agents. Similarly, while sustainable development theorists have strongly encouraged a drastic move towards local procurement, the evidence introduced here concluded that, although important, the ultimate potential for further substituting imports with local goods and services has remained marginal for the most part.

In the same way, and against claims which pronounce the end of philanthropy in mining, this research found that voluntary corporate expenditure continued to be a major instrument for community engagement. Limits to the benefits that locals have been able to exert directly from mining activities meant that large companies have continued to employ discretionary social investment as a means to offset the effect of negative economic externalities, including, for instance, the worsening of local income distribution, food inflation and further price distortions. Noteworthy, and in contrast with previous practice, the three companies analysed have delineated these interventions and defined their investment priorities in full consultation with local communities and governments. More generally, whether or not these funds could successfully respond to the specific challenges emerging at the local level, and thereafter underpin local economic sustainability, it will ultimately depend on the use that these cash flows are put to by local economic agents. In this sense, despite many of the identified challenges being common to all local mining economies, this work has shown that local preconditions have determined socioeconomic outcomes to a significant extent.

Contrary to previous paradigm shifts in mining, the SD model did not result from changes to the underlying structure of mineral production. Rather, it was the industry's response to the consolidating demands of a changing world for companies to adjust outdated operating practices. While being seen as doing the right thing certainly played a role, the adaptation undergone by these businesses was driven by a legitimate desire to improve their legacy in impacted areas, and as such was reflected at every hierarchical level in the organisations. In particular, they have strived to secure sustainable economic opportunities for those directly affected by the operations, and in doing so they mobilised significant resources. It has been argued, however, that the inability to increase local benefits beyond a certain threshold should not necessarily be seen as policy failure. This study suggested that new mining practices have in cases promoted unattainable economic expectations at the local level, and have set blanket targets hastily accredited as part of SD principles. To move away from this corner it will be critical to produce dispassionate diagnoses on a case specific basis before agreeing on precise action plans with the relevant stakeholders. In cases, for instance, the region may be a more appropriate geographical target than the local level; in others, the nation may be more appropriate than the region.

In other cases, mining companies showed significant potential to catalyse economic growth and set off long-term processes of economic development locally. While mining has long been ignored as a possible trigger of endogenous growth, this research showed that its potential has been notoriously underestimated. On the one hand, mining contributed distinctly to local capital accumulation in the cases analysed. More critically, on the other hand, large mining enterprises can help sustain increases in total factor productivity in the local economy. As such, this research finds that there is nothing intrinsic in mining that should prevent mineral income from being re-invested in other forms of capital to promote longer term economic development. That said, while the technology, skills and managerial practices of large operations will sometimes spill over and be absorbed by the rest of the economy, the industry's propensity to influence the rate of this absorption will largely depend on the initial level of technology and skills in the economy, and the local ability to adapt to change. Yet, this work showed that mining enterprises can make a remarkable contribution to local governance and play a critical part in economic planning and the building up of innovative institutional frameworks, which could, in turn, help increase the prevailing stock of technological and human capital locally.

This entails a whole new role for mining companies – and this analysis showed how some of them have been taking encouraging steps. Conversely, this research also highlighted the controversial nature of this new function. In effect, a complete sense of balance between key stakeholders concerning this new approach has not yet been reached, and it is conceivable that the type of backlash identified in this work may eventually lead to companies giving up on these efforts. In due course, revisiting these case studies would be necessary to elucidate whether progress has been made in this regard. The new course of action discussed here has demanded significant resources from companies, these being in money, time or skills. In taking this approach to the next level, firms will want to understand what benefits could be expected from their involvement. Significant risk reduction has often been promised as a reward, although there are no sufficient business analyses rigorous enough to establish this link categorically. Further investigations into this field would be welcome. Finally, it was noted throughout that this study focussed on economic sustainability. Previously, a considerable amount of research had been conducted in the ecological and social dimensions of the SD agenda. As the acceptance of ongoing trade offs among these dimensions is gaining ground, further work on the concept of *net positive effect* from a mine will constitute another critical area for future investigation.