

Linkages to the Resource Sector

The Role of Companies, Government and International Development Cooperation

As a federally owned enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

Published by:

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Friedrich-Ebert Allee 36 + 40	Dag-Hammarskjöld-Weg 1-5
53113 Bonn, Germany	65760 Eschborn, Germany
T +49 228 4460-0	T +49 61 96 70-0
F +49 228 4460-1766	F +49 61 96 79-1115

E info@giz.de
I www.giz.de

Programme/project description:

Sector Project Sustainable Economic Development

Author:

Columbia Center on Sustainable Investment (CCSI)

Design and layout:

Stefan Mümpfer, grafic works, Frankfurt Main

URL links:

This publication contains links to external websites. Responsibility for the content of the listed external sites always lies with their respective publishers. When the links to these sites were first posted, GIZ checked the third-party content to establish whether it could give rise to civil or criminal liability. However, the constant review of the links to external sites cannot reasonably be expected without concrete indication of a violation of rights. If GIZ itself becomes aware or is notified by a third party that an external site it has provided a link to gives rise to civil or criminal liability, it will remove the link to this site immediately. GIZ expressly dissociates itself from such content.

Maps:

The maps printed here are intended only for information purposes and in no way constitute recognition under international law of boundaries and territories. GIZ accepts no responsibility for these maps being entirely up to date, correct or complete. All liability for any damage, direct or indirect, resulting from their use is excluded.

GIZ is responsible for the content of this publication.

On behalf of
German Federal Ministry for Economic Cooperation and Development
(BMZ)
Division 114 Cooperation with the private sector; sustainable economic
policy
Contact person at the ministry
Andreas Beckermann, Berlin

Printing and distribution:
druckriegel GmbH, Frankfurt am Main

Printed on 100% recycled paper, certified to FSC standards.

Eschborn, 2016

Table of Contents

LIST OF FIGURES	4
LIST OF TABLES	5
LIST OF BOXES	5
ACRONYMS	6
EXECUTIVE SUMMARY	8
1. INTRODUCTION	12
2. LINKAGES	13
2.1 OVERVIEW OF LINKAGES	13
2.2 PRODUCTION LINKAGES: UPSTREAM/BACKWARD LINKAGES	17
2.2.1. LITERATURE REVIEW AND CASE STUDIES	22
2.2.2. LESSONS LEARNED FROM THE LITERATURE AND CASE STUDIES	31
2.3 PRODUCTION LINKAGES: DOWNSTREAM/FORWARD LINKAGES	33
2.3.1 LITERATURE REVIEW AND CASE STUDIES	35
2.3.2 LESSONS LEARNED FROM THE LITERATURE AND CASE STUDIES	41
2.4 PRODUCTION LINKAGES: HORIZONTAL/LATERAL LINKAGES	42
2.4.1 LITERATURE REVIEW AND CASE STUDIES	43
2.4.2 LESSONS LEARNED FROM THE LITERATURE AND CASE STUDIES	45
2.5 SIDE-STREAM LINKAGES: KNOWLEDGE AND TECHNOLOGY LINKAGES	47
2.5.1 LITERATURE REVIEW AND CASE STUDIES	48
2.5.2 LESSONS LEARNED FROM THE LITERATURE AND CASE STUDIES	51
2.6 SIDE-STREAM LINKAGES: SPATIAL/INFRASTRUCTURE LINKAGES	53
2.6.1 LITERATURE REVIEW AND CASE STUDIES	56
2.6.2 LESSONS LEARNED FROM THE LITERATURE AND CASE STUDIES	61
2.7 CONSUMPTION LINKAGES	62
2.7.1 LITERATURE REVIEW AND CASE STUDIES	63
2.7.2 LESSONS LEARNED FROM THE LITERATURE AND CASE STUDIES	66
3. CONSTRAINTS ON LINKAGE POLICIES	68
3.1 INTERNATIONAL LEGAL FRAMEWORKS	68
3.1.1 WTO RULES	68
3.1.2 INVESTMENT TREATIES	69
3.2 CHANGING PRODUCTION PROCESSES	74
3.2.1 FRAGMENTATION OF THE GLOBAL VALUE CHAIN	74
3.2.2 AUTOMATION	75
3.2.3 LESSONS LEARNED	78
4. RECOMMENDATIONS BY STAKEHOLDER	79
4.1 EXTRACTIVE INDUSTRY COMPANIES	80
4.2 GOVERNMENTS	82
4.3 INTERNATIONAL DEVELOPMENT COOPERATION	84
5. REFERENCES	88
6. ANNEX	94
ANNEX 1 – VISUALIZATION OF FRAMEWORKS DESIGNED TO EXPAND LOCAL PROCUREMENT OPPORTUNITIES OVER THE LIFE OF AN EI PROJECT	94
ANNEX 2 – WORLD TRADE ORGANIZATION AND LOCAL CONTENT – DETAILED INFORMATION ...	98

List of Figures

Figure 2.1: Linkages to the EI sector: Example of an iron-ore mine 14

Figure 2.2: Employment opportunities throughout the life cycle of an EI project..... 15

Figure 2.3: Value added multipliers of various analyses..... 16

Figure 2.4: Examples of direct, indirect and induced employment figures..... 17

Figure 2.5: Upstream linkages..... 18

Figure 2.6 Value create by BP and Anglo American in 2014 18

Figure 2.7: Company types and spending patterns..... 19

Figure 2.8: Mining spending on goods and services along the mining life cycle
(Share of life of mine cost, %)..... 20

Figure 2.9: Difference between mining and oil and gas expenditure over goods and services
(Cost breakdown by cost type, %) 21

Figure 2.10: Procurement of goods and services in Zambia’s copper sector..... 22

Figure 2.11: SWOT analysis for upstream linkages 33

Figure 2.12: Downstream linkages 33

Figure 2.13: Typical EI value chain..... 33

Figure 2.14: Tin and tantalum journey before the final consumer buys a phone..... 35

Figure 2.15: Diamond value chain..... 36

Figure 2.16: SWOT analysis for downstream linkages..... 42

Figure 2.17: Horizontal linkages 43

Figure 2.18: SWOT analysis for horizontal linkages..... 47

Figure 2.19: Knowledge and technology linkages..... 47

Figure 2.20: Channels through which knowledge and technology can be transferred..... 48

Figure 2.21: SWOT analysis of knowledge linkages..... 53

Figure 2.22: Spatial linkages..... 54

Figure 2.23: Transport linkage potential by commodity..... 55

Figure 2.24: Water linkage potential by commodity..... 55

Figure 2.25: Power linkage potential by commodity 55

Figure 2.26: Costs and benefits of sharing infrastructure..... 56

Figure 2.27: SWOT analysis for spatial linkages 62

Figure 2.28: Consumption Linkages..... 63

Figure 2.29: SWOT analysis for consumption linkages..... 67

Figure 3.1: Annual and cumulative number of IIAs concluded 70

Figure 3.2: GVC Development Path by Country..... 75

Figure 3.3: Shifting nature of value-chain integration..... 76

Figure 3.4: Employment impact of different technologies implemented over time..... 77

Figure 4.1: Relevant recommendations by linkage type and stakeholder 79

Figure 6.1: Opportunities for upstream linkages along the mine life cycle..... 94

Figure 6.2: Procurement opportunities along the oil and gas value chain..... 95

Figure 6.3: Assessing available upstream linkage opportunities 96

Figure 6.4: Adjusting local content policy throughout the mine cycle..... 97

List of Tables

Table 2.1:	Summary of key characteristics of upstream linkages.....	32
Table 2.2:	Summary of key characteristics of downstream linkages	41
Table 2.3:	Summary of key characteristics of horizontal linkages	46
Table 2.4:	Summary of key characteristics of knowledge and technology linkages	52
Table 2.5:	Summary of key characteristics of spatial linkages.....	61
Table 2.6:	Summary of key characteristics of spatial linkages.....	67
Table 3.1:	Overview of WTO measures and impacts on linkage policies.....	69
Table 3.2:	Summary of restrictions under international law	73

List of Boxes

Box 2.1:	Employment and gender impact of ASM	17
Box 2.2:	South Africa's upstream supplier sector	24
Box 2.3:	Dealing with access to information	25
Box 2.4:	Nigeria's local content development	26
Box 2.5:	Mexico's approach to local content as of 2014.....	28
Box 2.6:	The Australian Industry Participation Framework.....	28
Box 2.7:	Partnerships between companies and international development cooperation in Madagascar	29
Box 2.8:	Rio Tinto, IFC and Women Suppliers in Guinea	30
Box 2.9:	The World Bank's Gender and EI programmes	31
Box 2.10:	Botswana moving downstream in the diamond value chain.....	37
Box 2.11:	Cost-benefit analysis of the economic impacts of Indonesia's export ban.....	39
Box 2.12:	Costs and benefits from the Mozal aluminium smelter in Mozambique	40
Box 2.13:	South Africa and horizontal linkages.....	44
Box 2.14:	Finland's leadership in electronics arose from its forestry sector	45
Box 2.15:	Statoil acquires management practices from Mobil	49
Box 2.16:	Anglo Zimele Programme in South Africa	50
Box 2.17:	World Class Suppliers Programmes in Chile.....	51
Box 2.18:	The Simandou Southern Growth Corridor in Guinea	57
Box 2.19:	How Katanga copper mining's power requirements have been leveraged to improve the power system in DRC	58
Box 2.20:	The experience of Freeport McMoran in Peru with shared water infrastructure.....	59
Box 2.21:	The use of rights of way in Brazil along the Bolivia-Brazil gas pipeline	60
Box 2.22:	Chile's import substitution industrialization policy	64
Box 2.23:	Targeting agricultural productivity of smallholder farmers in Mozambique	65
Box 3.1:	Mobil vs. Canada: IIA dispute challenging use of "performance requirements"	72
Box 6.1:	China's rare earths dispute from the point of view of Chinese policy-makers	99

Acronyms

AIP	Australian Industry Participation Framework
AMV	Africa Mining Vision
ASM	Artisanal and Small Scale Mining
AUA	African Union Agenda
BP	British Petroleum
CARA	Regional Business Center (Centre d’Affaires Régional) in Anosy, Madagascar
CCSI	Columbia Center on Sustainable Investment
CHINALCO	China Aluminium Corporation
COMRO	Chamber of Mines Research Organization, South Africa
CORFO	Chilean Development Corporation
CPI	Mozambique Investment Promotion Center
CSR	Corporate Social Responsibility
DRC	Democratic Republic of Congo
EI	Extractives Industry
FET	Fair and Equitable Treatment
FDI	Foreign Direct Investment
GASBOL	The Brazil-Bolivia Pipeline
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICMM	International Council on Mining and Metals
ICN	Industry Capability Network
ICT	Information and Communication Technology
IFC	International Finance Corporation
IOC	International Oil Corporations
ISI	Import Substitution Industrialization
JSDF	Japanese Social Development Foundation
LNG	Liquefied Natural Gas
NASA	U.S. National Aeronautics and Space Administration
NCCF	Nigerian Content Consultative Forum
NCDF	Nigerian Content Development Fund
NCDMB	Nigerian Content Development and Monitoring Board
NNPC	Nigerian National Oil Company
NSI	National System of Innovation
OKM	Finnish Research and Innovation Council
PDR	Lao People’s Democratic Republic
QMM	QIT Madagascar Minerals, S.A.

ACRONYMS

R&D	Research and Development
SAMP	(Australian) Supplier Access to Major Projects
SCM Agreement	Agreement on Subsidies and Countervailing Measures
SDG	Sustainable Development Goals
SEDAPAR	Peruvian Water and Sewage Service
SME	Small and Medium-Sized Enterprises
SNEL	National Electricity Society of the Democratic Republic of Congo
TRIMs	Trade-Related Investment Measures
UNIDO	United Nations Industrial Development Organization
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollar
USPTO	United States Patent and Technology Office
WIM	Women in Mining
WTO	World Trade Organization

Executive Summary

Many developing countries have become increasingly resource dependent over the last two decades. While the end of the 'commodity-super cycle' may halt this trend in the short term, half of the world's known oil, gas and mineral reserves are in non-OECD and non-OPEC countries (Mc Kinsey, 2013). For these resource-rich developing countries, the extractive industries (EI) sector presents one of the few comparative advantage sectors, which will inevitably continue to play an important role in their respective economic development strategies. Historically, much emphasis has been placed on how developing countries can attract foreign direct investment in the EI sector to increase domestic revenue collection. Less focus has been placed on how foreign EI investments can be 'linked' to the domestic economy to increase the skill level in the country and diversify the economy in the long term. This report explains the various linkages that can be created to the EI sector, provides case studies that exemplify how countries have successfully leveraged the respective linkages, lays out the key constraints to linkage creation, and provides recommendations to EI companies, governments and international development cooperation on how each stakeholder can contribute to linkage creation. The report has been commissioned in the frame of German Development Cooperation, which supports many developing countries where the EI sector plays an important role in their respective economies. Where relevant, special emphasis has been placed on the impacts of linkages on employment creation and gender equality, given that these two topics are of strategic importance to German Development Cooperation.

Linkages to the EI sector

The report differentiates among **upstream linkages**, which are related to the procurement of goods and services that EI projects need to operate; **downstream linkages**, which result from further processing of the extracted commodity; **horizontal linkages**, which relate to the development of new industries using the capabilities of the EI-related supply chain; **consumption linkages**, which result from increased spending of earnings originating from the EI sector; **knowledge and technology linkages**, which relate to the transfer of knowledge and technical know-how within the EI value chain; and **spatial linkages**, which are the benefits from shared use of infrastructure investments that the EI sector requires to operate. The spending of EI companies on suppliers dwarfs royalty and tax payments. BP and Anglo American estimate that in

2014 they respectively spent 87% and 64% of total value created on suppliers as compared to 2% and 11% on government payments. These figures explain why governments are increasingly relying on local content regulations that require EI companies to purchase goods and services domestically. Apart from increasing the number of companies producing goods and services for the EI sector, which in turn creates additional indirect employment opportunities, upstream linkages also have the potential to improve the expertise and quality of goods and services of suppliers, given that EI companies require high international standards that have to be met. However, in many resource-rich developing countries domestic companies do not have the expertise to produce the required goods and services due to lack of experience and access to finance, and cannot make the necessary investments to meet the standards. In such circumstances, there is a need for financial, technical and technological support programmes to domestic companies that have the potential to become suppliers to the EI sector; long term procurement plans need to be provided that lay out the potential opportunities for suppliers over the lifetime of the project; tenders have to be unbundled and adapted to fit the local context; and local content strategies need to place importance on local value-added rather than ownership and have realistic targets that are updated on a regular basis. The upstream sector has the greatest potential to promote female employment given that it offers the opportunity to outsource activities in areas such as catering that have higher female participation rates.

While many resource-rich country governments prioritise moving downstream to add value to their commodities domestically rather than exporting them in an unprocessed form, the literature does not find supporting evidence that access to natural resources plays a big role in making the downstream industries competitive. In most cases, moving downstream therefore requires strong government interventions. Governments may use their negotiating power to require further processing when awarding highly valuable resource concessions, use incentives to make downstream projects economically viable, or use export restrictions such as taxes and bans. Governments should be aware that in all cases where companies do not move downstream voluntarily, government intervention is likely to come at a cost in the form of tax revenue losses from the EI project, required spending to support the downstream sector and marginal mining projects not going ahead or closing. Such a policy decision therefore requires a cost-benefit analysis by govern-

ments to assess whether the benefits associated with ‘first degree’ downstream processing such as smelting and refineries compensate for the costs and whether there is potential for the sector to be internationally competitive in the medium to long term. These projects tend to be capital and energy intensive, while also requiring good access to infrastructure. The employment and technology transfer benefits associated from moving downstream often only increase at the second and third degree downstream industries, such as fabrication and assembly, which are equally difficult to attract.

Whereas it is relatively straightforward to identify upstream and downstream linkages, it is harder to assess whether horizontal linkages have been created given that it is not always clear what the main contributors are for new sectors to emerge and whether the experience and expertise from the EI sector had a role to play therein. Therefore the literature on this linkage type is relatively sparse with few case studies from which to learn. However, horizontal linkages provide a unique opportunity to diversify the economy away from the EI sector. Horizontal linkages can stem both from transferable skills that are not sector – specific (IT, finance, civil engineering, etc.) and from the adaptation of the capabilities, know-how and technologies developed to serve the EI sector. As such, they are more likely to occur in countries where upstream linkages have already been created (most horizontal linkages stem from suppliers to the EI sector). To foster horizontal linkages, research and development initiatives should be created that provide financial incentives for first mover companies to explore opportunities in other sectors; high skilled training institutes should be built that support the transfer of capabilities from one sector to another; and the creation of clusters of industries with synergies to the EI sector should be promoted.

Consumption linkages are less relevant today than they were during the years when import substitution industrial policies were widely used, as earnings leak abroad through the consumption of imported goods. The ‘natural’ geographical barriers have also become less relevant today due to globalisation and falling transport costs. The sectors that are most suited to create consumption linkages relate to services that require local presence such as the transport and restaurant industry; goods that have a high transport-to-value ratio such as cement, bricks and other construction materials; and perishable agricultural produce that cannot be stored or transported for long time periods. Apart from benefit-

ting from the geographical advantage, the demand for these goods and services is also closely associated with economic growth in booming regions. Future demand analyses that take into account the EI sector should be part of assessments that identify investment opportunities for the private sector to create these consumption linkages. Improving financial access and attractive interest rates on savings may encourage workers and companies in the EI sector to keep earnings within the country rather than channelling them offshore. Out of all the linkages, consumption linkages have the greatest potential to create employment opportunities (referred to as induced employment). But because the effect of EI projects on the growth of local demand is not easy to trace, it is difficult to measure induced employment and multipliers vary widely. Therefore, care needs to be taken when induced employment numbers are provided.

One of the key reasons to attract foreign direct investment in the EI sector in the first place is the need for knowledge and sophisticated technologies to extract the resources, which are often not available domestically. There is a strong incentive for host countries to absorb knowledge, skills and technology from the foreign investor. Whereas horizontal linkages enable actors to adapt their capabilities to *other sectors*, knowledge and technology transfers enable them to improve those skills *within* the EI value chain. There are four channels through which knowledge and technology linkages can be transferred: (1) the demonstration-imitation channel, by which knowledge and technology is adapted from EI companies, (2) the labour mobility channel, by which employees trained by EI companies move into the domestic economy and apply their acquired knowledge and expertise there, (3) the upstream-linkage channel, by which the multinational corporation transfers knowledge and technology to domestic suppliers in order to help them meet certain standards, and (4) the export channel, by which EI companies enable local companies to access international markets. The key determinant whether knowledge and technology linkages can be created is the pre-existing level of expertise available in the host country or the existing ‘absorptive capacity’. If the knowledge and technology gap between the EI companies and national employees/suppliers/state owned companies is too large, transfers are likely to be minimal. Therefore partnerships between these stakeholders should focus on skill development. Efforts need to be taken to build the national expertise by improving the education system through targeted vocational trainings, integrating courses that will serve the EI sector in tertiary

educational programmes and promoting research and development with national institutions. Intellectual property rights should be tailored to the development stage of the host country.

Spatial linkages provide an opportunity to address the infrastructure-financing gap that developing countries face. Given that resources are often located in remote regions, EI companies invest in transport, power, water and ICT infrastructure that is required for their operations. In addition to improving infrastructure access to surrounding regions and thereby potentially unlocking economic opportunities that were previously not economically viable, economies of scale and scope can be achieved when this infrastructure is shared. Economies of scale, because one infrastructure investment with a larger capacity is oftentimes cheaper than investing in two separate infrastructure projects (one 400MW power plant, for example is going to be cheaper than two 200MW power plants); and economies of scope, because costs associated with one type of infrastructure investment can be shared with another type of infrastructure investment (when building oil pipeline infrastructure, for example, fibre optics cabling can be deployed at a reduced cost, given that up to 80% of costs are associated with civil works). However, building infrastructure at a higher capacity or adapting the infrastructure for additional users is likely to result in higher capital, operational and logistical costs, which explains why EI companies may be against shared use. Requirements for shared use therefore should only be made on a case-by-case basis when the associated net benefits are higher than the costs for society. To assess how EI infrastructure investments can be leveraged, infrastructure master plans should map out the economic potential of the regions and population centres that may benefit from infrastructure investments. Governments need to set aside resources to invest in feeder infrastructure to benefit other users. The implementation of shared use will require strong public utilities to serve as viable partners to EI companies. An independent regulator that oversees access and tariffs is also required.

Constraints on creating linkages

International law places some restrictions on the tools governments can use to encourage the development of the linkages discussed above. These rules have both proliferated and become more stringent over the last 20 years, implying that countries which are now seeking to develop these linkages are governed by a legal framework very different than the one in place prior to the World Trade Organisation's

(WTO) creation in 1995 and the subsequent proliferation of international investment agreements. Under the WTO three new international agreements entered into force that set out rules relevant for linkage policies: (1) the Agreement on Trade-Related Investment Measures (TRIMs), which restricts government measures that require mining companies to source domestic over foreign goods and impose export restrictions in order to incentivise downstream processing; (2) the Agreement on Subsidies and Countervailing Measures (SCM), which prevent governments from using incentives and granting subsidies that are contingent on sourcing goods domestically; and (3) the General Agreement on Trade in Services (GATS), which, in scheduled services sectors, can prevent governments from providing advantages to domestic firms that are not similarly provided to foreign enterprises, as well as requiring domestic equity participation and joint ventures. International investment treaties, of which presently roughly 3000 have been concluded, often go beyond the restrictions of WTO agreements, e.g. by barring governments from requiring technology transfer and local research and development programmes. These treaties usually also use investor-state arbitration rather than WTO's state-to-state arbitration system, which increases the likelihood of actions being filed. To avoid being taken to arbitration and to ensure they retain appropriate policy tools for promoting linkages, governments therefore need to ensure policy coherence when signing investment treaties.

Apart from the international legal framework, stakeholders also need to be aware of changing production processes within the EI value chain. These are increasingly fragmented and unbundled with countries becoming specialized in specific tasks and business activities rather than sectors and industries. Higher value added functions are progressively concentrating in technologically advanced countries and lower value added activities are located in countries with low labour costs. Furthermore, there is a trend towards automation in the sector. This will increase productivity and improve the health and safety record of the industry, but at the same time will further reduce the number of people employed in the sector and alter procurement requirements. Resource-rich countries therefore need forward-looking policies that have education, skill and technology development at their core.

Recommendations by stakeholder

Extractive industry companies

EI companies can play a major role in supporting the creation of linkages, particularly those that are directly relevant

to their core operations, which include upstream, knowledge and technology, and spatial linkages. To support the former two, EI companies can publish long-term procurement plans in order for potential suppliers to have sufficient time to prepare for tenders, adapt tenders to local realities for domestic companies to be able to bid for them, provide financial assistance to local suppliers, design vocational training programmes to train future employees and service providers, and create joint research projects with universities to specialize and improve the technology suited for the geology of the country. To develop spatial linkages EI companies should collaborate with government entities and other companies to explore potential economies of scale and scope. Lastly, it is important for EI companies to manage expectations - especially when it comes to direct, indirect and induced employment opportunities. In this regard, EI companies should act with care and roll out public awareness campaigns that explain whether opportunities are likely to benefit international, national and/or local employees/suppliers.

Host country governments

The lack of policy coherence and coordination among government agencies is one of the biggest stumbling blocks in creating linkages. A long-term development strategy can provide a vision and guidance for the development targets the country wants to achieve. In resource-rich countries industrial, diversification and local content policies can guide how the EI sector contributes to achieve these targets. These should not conflict with international commitments made under the WTO and international investment agreements. A significant emphasis should be placed on strengthening the absorptive capacity of the local population by improving education, providing vocational trainings in disciplines that are and will be in high demand, and promoting research and development programmes. Small and medium sized enterprises, especially those that do not qualify for company supplier programmes, should be supported. To foster spatial linkages the legal framework should allow for governments to require shared-use infrastructure access when the benefits are larger than the costs for society. Finally, governments should consider opportunities beyond their countries' borders when assessing linkages from the EI sector. Unviable linkages at the national level may become viable at the regional level and costs may be reduced significantly by sharing these with neighbouring countries.

International development cooperation

Both technical and financial development cooperation have a role to play in helping to create linkages to the EI sector. The latter can provide financing to the EI project itself, to associ-

ated infrastructure investments and to domestic suppliers of the EI project. Apart from requiring high social and environmental standards, financial development support often comes with technical assistance that may help maximise the potential linkages. Technical cooperation can leverage its expertise and experience in private sector development programmes from other sectors to support suppliers or potential future suppliers in meeting the required standards of the EI sector. Furthermore, technical cooperation is well placed to support governments with providing neutral analytical assessments that can feed into the long-term development strategy and industrial/diversification policy. As highlighted throughout the document, cost-benefit analyses are required to determine whether many of these linkages are worth pursuing. Finally, if looking to support linkage creation from the EI sector, international development cooperation should consider adapting their development assistance by aligning policy advice within and among development partners. Measures may include avoiding conflicting advice on local content and trade/investment treaties; lengthening project timelines given that linkage creation is a long-term process and unlikely to succeed in the short run; placing greater focus on artisanal and small scale mining given that this sector provides significant employment opportunities (including for women, who make up 30% of the world's artisanal miners), is often neglected by the government, and has devastating impacts on health and the environment; and designing support programmes that fit into the political economy of a country – the EI sector is characterised by large investment flows and rent seeking behaviour, which requires a fine balance between good practices while fitting into the local context, institutions and politics to have a meaningful impact.

Germany has four characteristics, which make it a good candidate to support linkage creation from the EI sector: (1) It has various agencies already involved in providing financial and technical support to both governments and EI companies in linkage creation; (2) Germany may benefit from being perceived as a neutral agent by both governments and EI companies given that it has less of a colonial history and the large EI companies are not based in Germany; (3) Germany's experience from its technologically advanced "Mittelstand" companies may prove useful in supporting small and medium sized companies to become suppliers to the EI sector; and (4) Germany is renowned for its dual education system and vocational training programmes. These four characteristics enable Germany to give targeted support to both governments and EI companies that will maximize the potential of linkages and contribute to sustainable development in resource-rich countries.

..... INTRODUCTION



The last decades have seen an unprecedented inflow of foreign direct investment (FDI) in extractive industry (EI) projects in developing countries. With the best deposits in established resource-producing countries being exhausted and high commodity prices in the first decade of the new Millennium, EI companies (private, publicly-listed and state-owned) have been more willing to venture into riskier resource-rich low-income (frontier) countries with the prospect of high profits if successful.¹ This trend is likely going to continue once commodity prices recover. Given that these frontier countries have a comparative advantage in the extraction of resources (often one of the only ones) and that EI projects make up a large proportion of their total investments, the question arises how to maximize the benefits of these.

While economic diversification is an often stated goal of resource-rich countries, developing new industries in sectors that are unrelated to current economic activities is more difficult than in sectors where the country already has a comparative advantage. As stated in the context of promoting development in Sub-Saharan Africa: the question *“is not whether Africa can industrialize by ‘ignoring’ its commodities, but rather how the latter can be used to promote value addition, new service industries and technological capabilities that span the sub regions of the continent.”* (UNECA 2013: 95). Tackling this question is at the core of the African Union’s Agenda, the African Mining Vision, and the Plan of Action for Accelerated Industrial Development of Africa. It is also subsumed under Goal 9 of the recently adopted Sustainable Development Goals (SDGs). Indeed SDG 9 – “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation” – gives a platform to address the question as to how countries can leverage their natural resources to industrialize and diversify. It is noteworthy that the SDGs place a lot more importance on how the private sector can contribute to development than their predecessors, the Millennium Development Goals, and this report also considers that EI companies have a major role to play to enable these linkages.

¹ The broader term “resource-rich countries” has been chosen over “resource dependent countries”, given that German Development Cooperation also provides support to developing countries that may not reach the export or revenue thresholds that are required to qualify for the latter term, but where support to create linkages to the EI sector may still be an important policy choice to consider.

In this context, and given that German Development Cooperation has been working to support resource-rich low-income countries in developing their EI sectors, the Sector Project Sustainable Economic Development (GIZ) approached the Columbia Center on Sustainable Investment (CCSI) to provide an overview of the potential linkages to the EI sector and to provide recommendations as to how EI companies, governments and the development cooperation can support the creation of linkages. This report is based on an extensive literature review as well as interviews with government officials, EI company representatives, development cooperation representatives, and academics working in this area. Case studies have been used throughout to provide examples where EI linkages have been created, both in terms of ‘breadth’ (number of linkages) and ‘depth’ (local value added). Where relevant, special emphasis has been placed on the impacts of the linkages on employment creation and gender equality, given that these two topics are of strategic importance to German Development Cooperation. The report is structured as follows: Following this introductory chapter, **Chapter 2** provides an overview of the different linkages to the EI sector. It includes a brief summary of the theory underpinning each linkage type, a literature review of the determinants required to capture the linkage; country case studies that illustrate how stakeholders have successfully supported the development of this type of linkage; and lessons learned, which are accompanied by a SWOT analysis² of each linkage type. **Chapter 3** lays out the constraints that resource-rich countries face in creating linkages to the EI sector. It includes the impact that trade and investment agreements have on the policy space of governments to support linkage creation; the increasing fragmentation of global value chains requiring particular expertise; and the increased automation of the EI sector. Finally, building on the lessons learned, **Chapter 4** suggests a set of recommendations for governments, EI companies and international development cooperation, with a special focus on the value added that German Development Cooperation may bring.

² Strengths, Weaknesses, Opportunities and Threats analysis

2 LINKAGES

2.1 Overview of Linkages

Typology of Linkages

There are seven types of linkages:

Fiscal linkages refer to the payments – such as royalties – that EI companies make to governments in order to extract and sell the resources. At the request of GIZ, this study does not focus on fiscal linkages, since these will be addressed in a separate report.

Production linkages refer to the goods and services that can be developed as a result of EI operations. These can be further divided into:

- **Upstream (or backward) linkages:** that relate to the procurement of goods and services that the EI sector requires to operate. For example, this includes welding services needed to maintain mining equipment.
- **Downstream (or forward) linkages:** that relate to the beneficiation of extracted commodities through refining, smelting and further downstream processing of the commodity before reaching the final consumer. For example, 98% of the world's mined iron ore is used to make steel and therefore needs to pass through a steel mill.
- **Horizontal (or lateral) linkages:** that relate to the development of new industries using the capabilities of the EI-related supply chain. Apart from originating from the EI project, horizontal linkages can occur from the upstream and downstream level. For example, mining trucks could be re-engineered and adapted to service the logging industry.
- **Consumption linkages:** relate to the demand for goods and services resulting from the spending of earnings from the EI sector. This effect is also referred to as **induced employment**. For example, when a truck driver employed to work at a mine site spends his salary on buying construction materials to build a family house.

Sidestream linkages (or enabling factors): relate to the supporting services, know-how and infrastructure necessary for the EI value chain to function. These can benefit the wider economy and can be sub-divided into:

- **Knowledge (technological) linkages:** relate to the transfer of knowledge and technological know-how. For example a mining company may require IT services with higher expertise. Apart from benefitting the mining company itself, the developed IT expertise may also benefit other sectors in the economy.
- **Spatial (infrastructure) linkages:** relate to the benefits associated with the infrastructure developed for an EI project profiting other actors in the economy. For example an iron-ore mine is likely going to require railway infrastructure. Other companies (from the mining sector and non-mining sectors) and passengers will benefit from this railway infrastructure if they are granted access.

The literature refers to three channels through which mining projects create employment in resource-rich countries:

- **Direct employment:** refers to the people directly employed by the EI company. For example, this includes the mine truck drivers in a mine.
- **Indirect employment:** refers to the people employed upstream and downstream from the EI sector.³ For example employees of a catering company that services a mine site.
- **Induced employment:** refers to the economic activity resulting from the spending of direct and indirect employees of an EI project (see example given for consumption linkages).

The figure on the next page provides an overview of the various linkages. Upstream, downstream and fiscal linkages are linked with the project itself. Horizontal, knowledge and spatial linkages can originate from the whole value chain, which is represented by the red arrow. Consumption linkages originate from the spending of employees from the EI project itself (direct employment) and the upstream and downstream businesses (indirect employment). The dot-

³ Some reports only include upstream linkages when referring to indirect employment.

ted yellow line represents those linkages which feed directly into the core operation of the project. This is of importance, because it indicates whether it is in the self-interest of the company to develop that particular linkage (domestically or internationally). For example, it is in the self-interest of an EI company to procure high quality goods and services from upstream companies and therefore it may consider support programmes that help transfer knowledge to meet these standards. However, the company is less likely to be concerned about potential developments in unrelated sectors of the economy and therefore the support of horizontal linkages would have to be government driven. While consumption linkages are not related to the core business of the EI company, they might still be of interest to EI companies to the extent that they might contribute to saving its social license to operate (see section 2.7 for further explanations).

Linkage opportunities are context specific

While each of the following sections sets out some of the preconditions for creating linkages and provides concrete examples of where linkages were successfully created, it must be borne in mind that linkage-creation is very context specific. Generalised conclusions are therefore of limited applicability.

Linkages depend on:

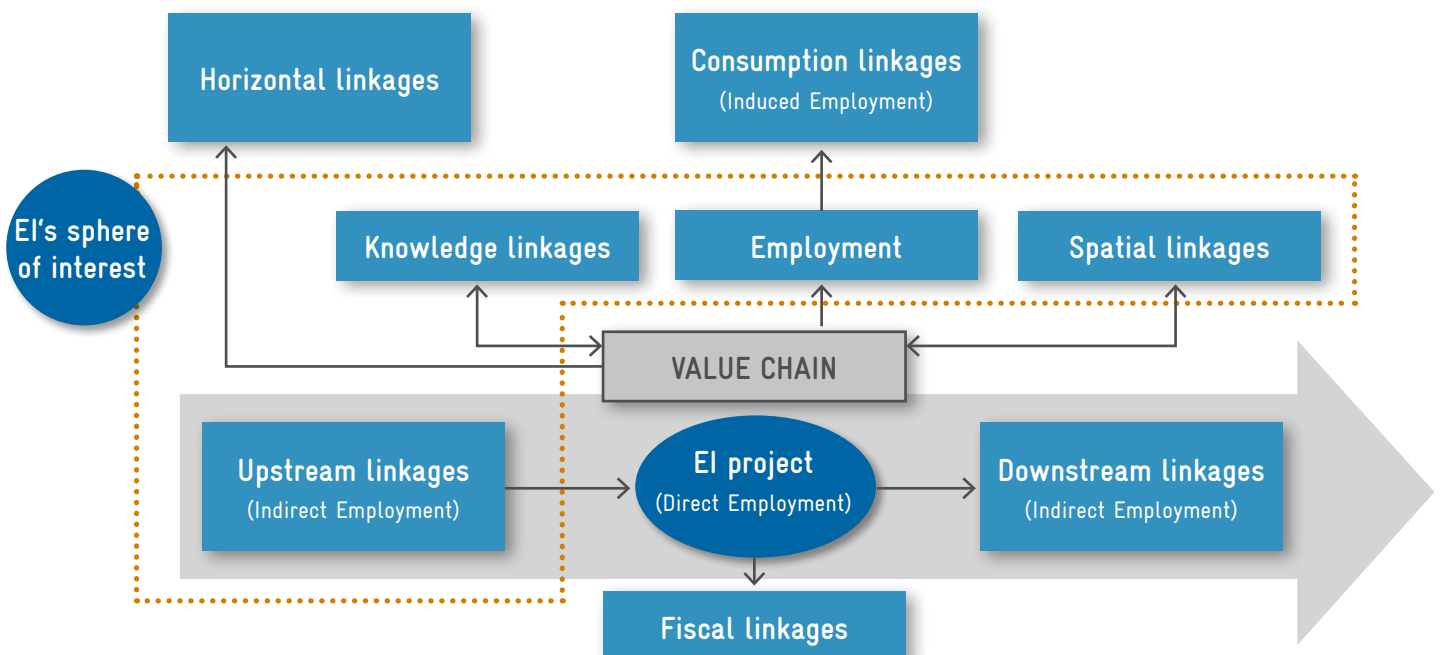
1. The commodity being extracted and extraction method:

Some commodities, such as diamonds require limited inputs, whereas others, such as copper, may require considerable processing. In turn, the type of operation can play a role; for example, offshore oil and gas and very deep underground mining require high level technical expertise. Depending on the local know-how and skills base, the type of commodity and extraction method may act as a barrier or enhancement of upstream and knowledge linkage creation (Kaplinsky, 2011). The production processes vary, with precious metals often having shorter exploitation periods than basic metals, which in turn will also determine whether there is sufficient extraction time that makes upstream and downstream linkages viable. Spatial linkages around rails and ports tend to be larger for bulk commodity projects, such as iron-ore and coal mines since these projects require large transport infrastructure investments to become viable. Fiscal linkages, on the other hand are more likely to be larger in oil projects, given that these tend to be more profitable.

2. The country context:

The opportunities for upstream, downstream, horizontal, knowledge, and technology linkages are highly dependent on the existing know-how and expertise in the country and region where the EI project operates. If the knowledge gap

Figure 2.1: Linkages to the EI sector



Source: Authors

is too large, the opportunities for these linkages are small. A country's history and experience with the EI sector plays an important role for all linkage types. With the exception of Botswana⁴, all countries analysed in Morris et al. (2012) show a positive correlation between how long the EI sector has been in operation and the depth and breadth of linkages. Hansen (2014) reports that there is a consensus in the literature that the time factor is essential. He finds that according to several authors (Amendolagine et al., 2013; Merlevede et al., 2011) the lack of linkages observed in many African countries could, in part, be attributable the “recent nature” of the “extractive FDI-based development”.

3. The life cycle of the project:

Few opportunities exist during the exploration phase given that this activity usually only involves a small specialized team on the ground. Employment figures peak during the construction phase, which is also the period in which consumption linkages could be maximized given the large number of employees/ contractors who may spend their earnings domestically. However, this time period may be too short to create sustainable upstream linkages if the contractors used for the construction phase cannot find additional opportunities in other infrastructure projects in the country when the phase ends. The production phase, in turn, is more suitable to build long-term upstream and downstream linkages to a project.

4 In Botswana, downstream linkages only started 2005 despite a long history of diamond exploitation.

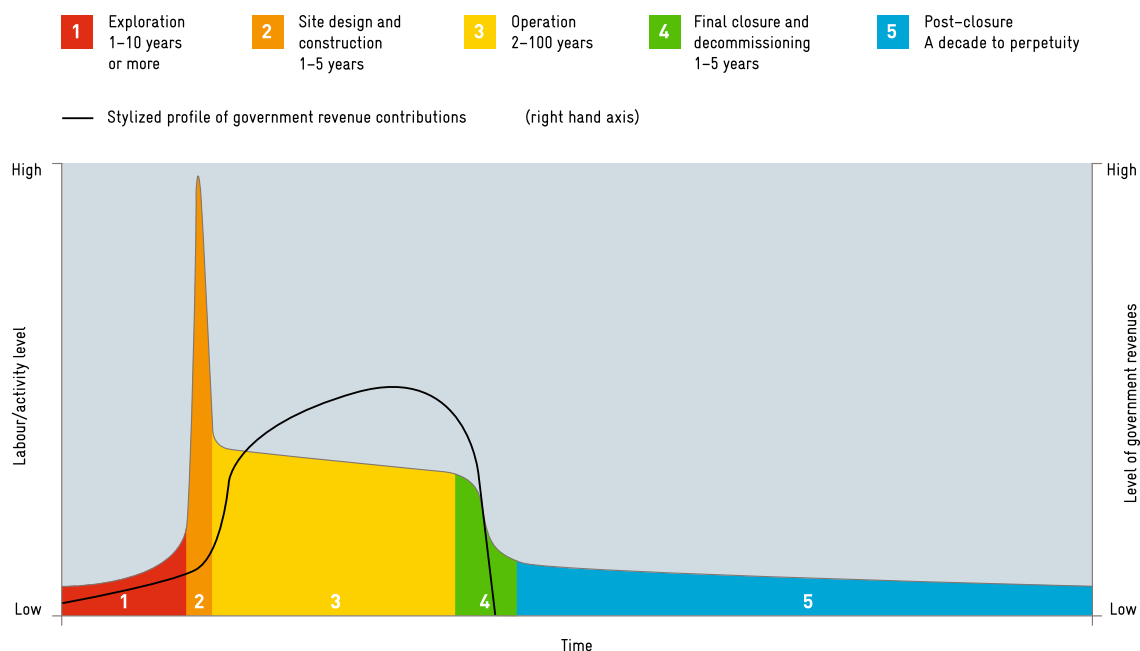
4. The ownership structure of the EI company:

Morris et al. (2012) argue that foreign ownership might be less conducive to linkage creation than domestic ownership for cultural and nationalistic reasons. This is most evident with state-owned EI companies that are often established with the mandate to spur economic domestic activities through upstream, downstream, spatial, and knowledge linkages. Their mismanagement can however negatively impact fiscal linkages. Among foreign investors, the Chinese state owned enterprises (SOE) stand out. These Chinese SOEs tend to display little appetite for investing in building the capabilities of the local workforce employed to work on investment projects. Instead, where skills are lacking in the local work force, Chinese companies tend to be quicker than their Western counterparts in replacing them with expatriate staff.

Employment

Intimately related to what determines the extent of linkages is the question of how many jobs will be created. While each chapter tries to address the extent to which each linkage type will lead to job creation, it is important to remember that multiple factors influence the employment creation potential of an investment, including: (1) the type of ownership (pub-

Figure 2.2: Employment opportunities throughout the life cycle of an EI project



Source: ICMM (2014), The Role of Mining in National Economies (2nd edition): Mining's Contribution to Sustainable Development.

lic versus private, foreign versus domestic); (2) the size of the project (small versus large-scale); (3) the life cycle phase of the project (see figure below); (4) the type of operation (off-shore versus on-shore, or open-pit versus underground); and (5) the type of commodity being extracted (as explained above) (CCSI, 2016 forthcoming).

Indirect employment opportunities will largely depend on the ability of local businesses to offer services and goods meeting the standards required by EI companies, whereas

induced employment opportunities will depend on the extractive region's ability to offer and ideally produce the consumption products that are in demand by employees in the resource sector. Multipliers capturing indirect and induced employment effects are calculated in different ways from one study to the next and are generated by different models, principally input-output (I-O) models and computable general equilibrium (CGE) models (CCSI, 2016 forthcoming). While the World Bank (2009) estimates that on average indirect employment is around 2-4 times larger

Figure 2.3: Employment multipliers of various analyses

INDUSTRY	LOCATION	DIRECT IMPACT	INDIRECT IMPACT	DIRECT AND INDIRECT IMPACT	SOURCE
Africa (not including South Africa)					
Mining	Tanzania	1.0	7.6	8.6	ICMM (2007) ⁵⁸
Gold mining	Tanzania	1.0	6.87	7.87	Ernst & Young (2013) ⁴⁴
Copper mining	Zambia	1.0	2.61	3.61	ICMM (2014) ⁴⁵
Gold mining	Tanzania	1.0	3.0	4.0	World Gold Council (2009) ⁵⁹
Gold mining	Mali	1.0	6.0	7.0	United Nations Conference on Trade and Development (2007) ⁶⁰
Median Value			6.0	7.0	
North America, Oceania, Europe and South Africa					
Gold mining	Canada	1.0	1.92	2.92	Dungan, P., Murphy, S. (2014) ⁵²
Gold mining	Canada	1.0	1.44	2.44	Dungan, P., Murphy, S. (2014) ⁵²
Gold mining	Australia	1.0	2.13	3.13	Minerals Council of Australia (2013) ⁶¹
Gold mining	New Zealand	1.0	1.19	2.19	Brent Wheeler (2003) ⁵³
Gold mining	Romania	1.0	3.25	4.25	Oxford Policy Management (2009) ⁵⁴
Mining	USA	1.0	1.8	2.8	Barnett, C (1999) ⁵⁵
Mining	South Australia	1.0	3.0	4.0	Barnett, C (1999) ⁵⁵
Median Value			1.92	2.92	
South America					
Mining sector	Tanzania	1.0	4.0	5.0	Mining Institute of Engineers of Peru (2010) ⁶²
Mining sector	Tanzania	1.0	1.9	2.9	World Gold Council (2011) ⁴⁶
Mining sector	Zambia	1.0	4.41	5.41	McCurdy, K., Keresztes, T. (2012) ⁴⁶
Large Copper and gold mines	Tanzania	1.0	2.84	3.84	Ernst & Young (2013) ⁴⁴
Medium gold mining	Mali	1.0	2.28	3.28	Ernst & Young (2013) ⁴⁴
Median Value			2.84	3.84	
Asia, Russia and CIS					
Mining	Mongolia	1.0	2.05	3.05	Stokes, E. (2005) ⁵⁶
Median Value			2.05	3.05	
Full sample median value			2.73	3.73	

Source: World Gold Council (2015), The Social and Economic Impacts of Gold Mining.

than direct employment in the mining sector and 1-4 times in the oil sector, it is very difficult to generalize the employment impact of linkages. This finding is also exemplified by the figure on the previous page, which provides an overview of the indirect multipliers in various projects in the gold sector. Multipliers vary significantly even for gold projects in the same country, such as in Tanzania (multiplier estimate of 6.87 vs. 3).

Taking into account the impact of induced employment, the multiplier can be as high as 10 or more according to certain studies (Apoyo 2009, Kapstein and Kim 2011).⁵ In fact, as shown in figures above and below respectively, induced employment is always much larger than indirect employment.

Figure 2.4: Examples of direct, indirect and induced employment figures

	EMPLOYMENT		
	Direct	Indirect	Indirect*
Escondida mine (Chile - 2004)	2,800	5,270	8,500 (up to 12,800)
Obuasi mine (Ghana - 2005)	6,670	1,000 (up to 5,000)	20,000 (up to 50,000)
Sepon mine (Chile - 2008)	2,460	2,450	12,300

* The indirect and induced employment figures are based on estimates on the assumption that certain multipliers (or multiplier options) apply. They relate solely to domestic employment effects.
Source: ICMM March & July 2007, 2011.

Source: GIZ (2015), Sustainable Economic Development in Resource-Rich Countries, Guidelines for Technical Cooperation.

What is less well understood and not reflected in direct, indirect and induced employment figures are the job losses that may result from large-scale EI projects. This is particularly relevant for the Artisanal and Small Scale Mining (ASM) sector, given that these miners often compete for the same deposits. The employment and gender impact of the ASM sector is often significantly larger in many developing countries where precious stones and metals are mined, as highlighted in the box 2.1, and should therefore play a central role in government policies and support programmes of international development cooperation (see recommendation D9).

⁵ Kapstein and Kim (2011) find that the employment multiplier for the Ahafo mine in Ghana was 28.

Box 2.1: Employment and gender impact of ASM

It is estimated that more than 20 million people are working globally in the ASM sector, 30% of which are female (World Bank, 2012). This means that just the proportion of women working in ASM is more than double the number of global employees in large-scale mining, which has been estimated at 2.5 million (ICMM, 2014).

In some countries ASM plays an even bigger role in the economy and the female participation is higher. In the Central African Republic, for example, two thirds of the population are thought to directly or indirectly rely on diamond mining. In Uganda it is estimated that 200,000 people (out of which 45% are estimated to be female) were engaged in ASM in gold, tin, coltan, wolfram and other industrial minerals in 2012.

However, the quality of the jobs in the ASM sector is often not as high as in the large-scale mining sector. Apart from often operating in the informal sector of the economy, the ASM sector is often associated with unsafe mining practices, low and unsteady salaries, health problems, environmental damage and conflict.

2.2 Production Linkages: Upstream/ Backward Linkages

Upstream or backward linkages relate to the procurement of goods and services that the EI sector requires to operate. The Figure 2.6 shows that this makes up the bulk of the money spent by EI companies. In 2014 upstream spending by BP and Anglo American made up 87% and 64% respectively (BP combined the capital cost spending into the supplier spending in its annual report, whereas Anglo American has separated it out). This compares with 2% and 11% of total spending on government payments respectively.

Figure 2.5: Upstream linkages

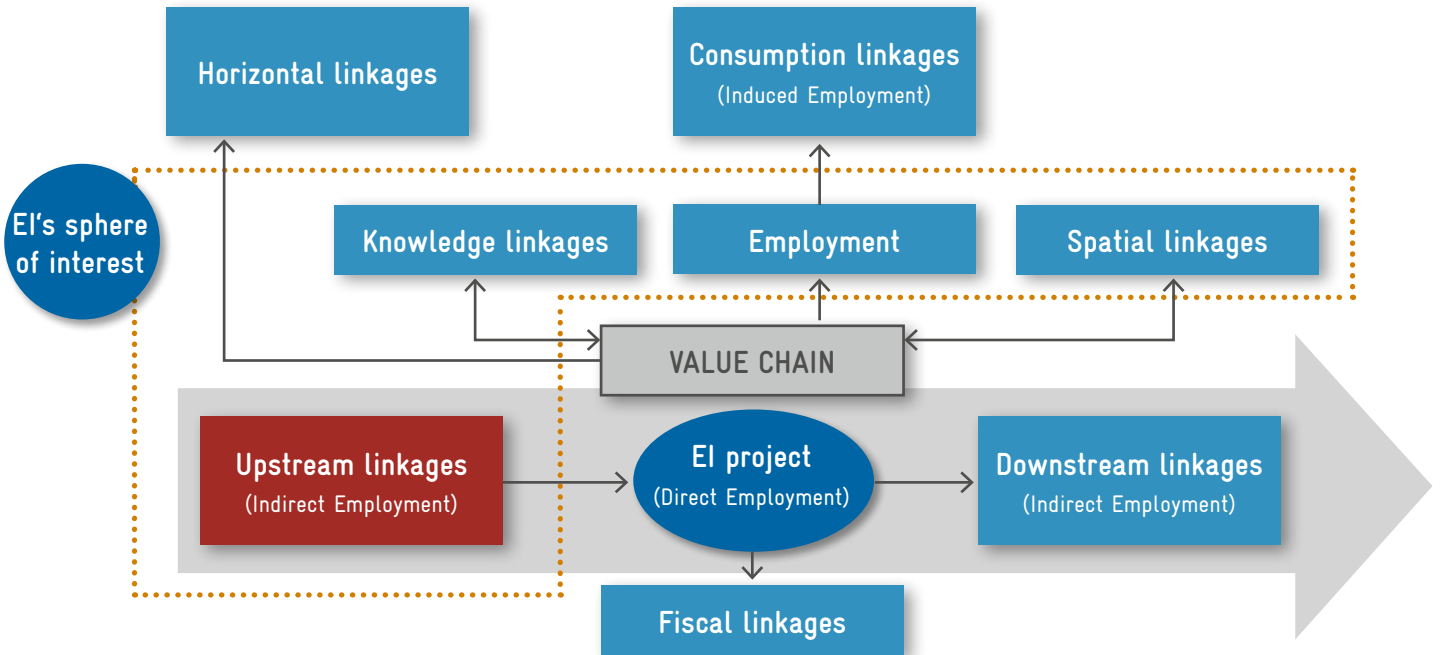
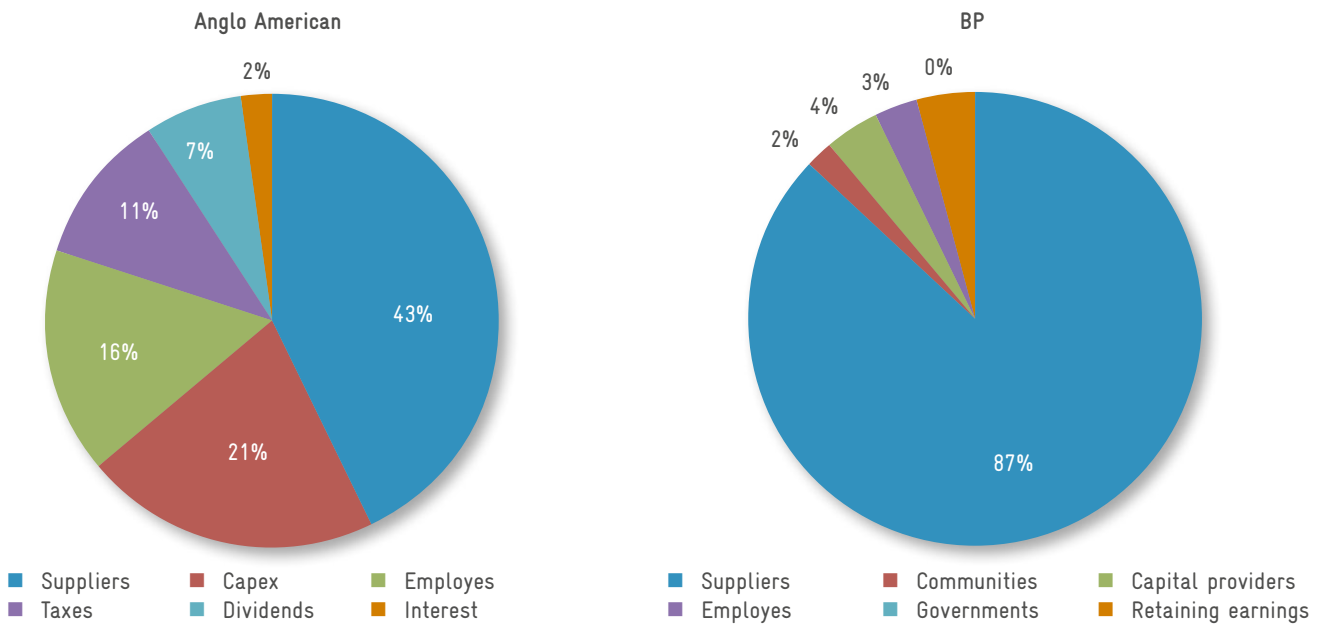


Figure 2.6 Value created by BP and Anglo American in 2014



Source: Own graph with data from Anglo American (2015) and BP (2015)

Figure 2.7: Company types and spending patterns

Type of industries	Characteristics and areas of activities	Examples of services and equipment needed
Global giants	Diversified portfolio, highly integrated	Insurance, trading services, consumables, transport services, employment agencies, market consultants, media relations, mining equipment, explosive and accessories
Senior companies	Vertical; Strategy (controllers); Commodity focus; Acquisitional	Insurance, consumables, employment agencies
Intermediate and national companies	Commodity focus; Acquisitional; Production; Investor/controller	Insurance, mining equipment, consumables, engineering contractors, consultancies
Expansory junior companies (large firms: assets worth > \$ 100 million)	Production; Development; Investment; Exploration	Risk assessors, camp services, consultancies, computer software, metal analysis, lab services, geophysics, drill contractors, mining equipment, environmental services
Exploration junior companies (small firms: assets worth < \$ 100 million)	Production; Development; Investment; Exploration	Same as above
Prospectors, private firms	Exploration	Regional promotion, legal and fiscal infrastructure consultants, airborne surveyors, mapping services pegging records

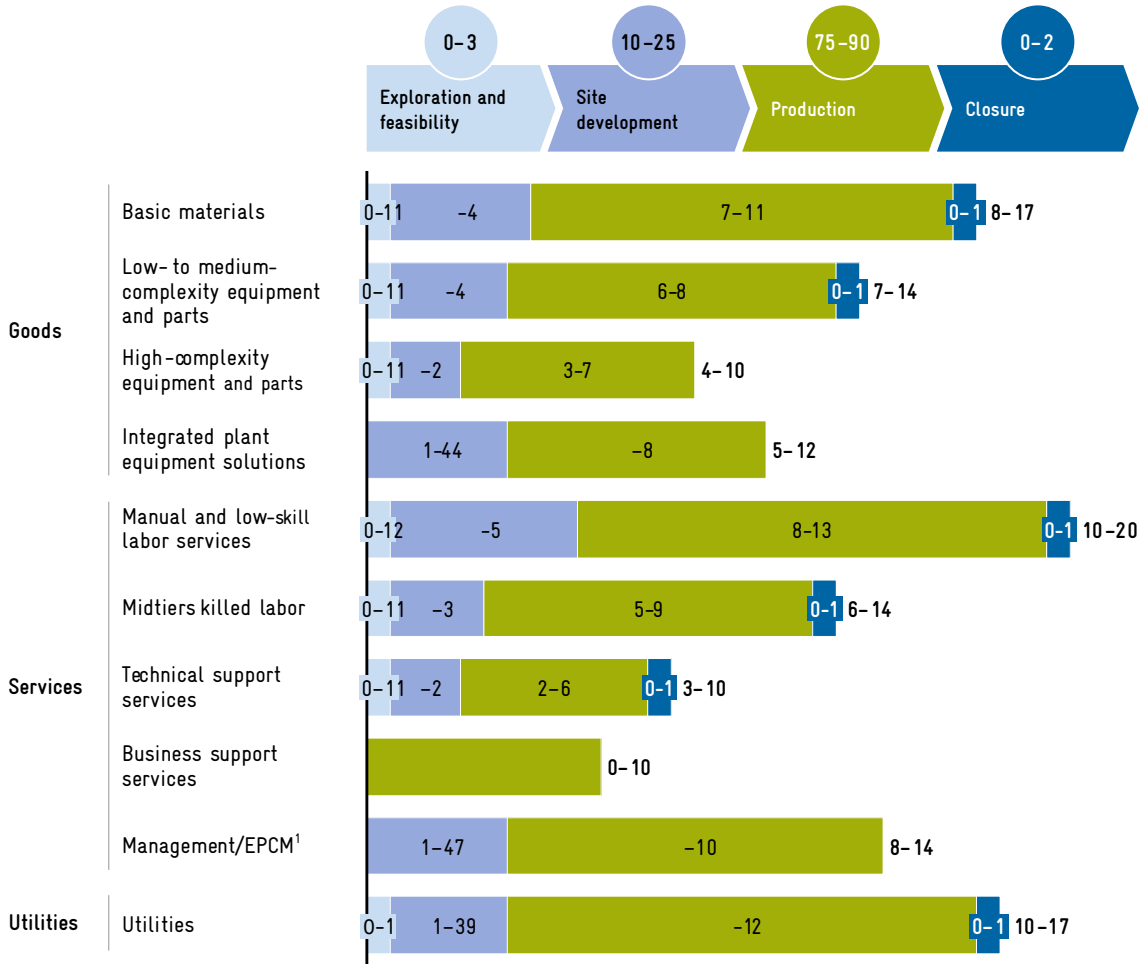
Source: Ramdoo (2015), Resource-based Industrialisation in Africa Optimising Linkages and Value Chains in the Extractive Sector.

It should be noted that the spending pattern of companies and the implications on the supply chain vary depending on the type of companies, as highlighted above.

Furthermore, different types of upstream linkage opportunities exist at the different stages of the project life cycle, with the greatest scope for upstream linkages during

the production stage. While varying by commodity and mine type, mining companies spend between 75-90% of their undiscounted nominal value during this phase of the project. This is illustrated in figure 2.8, which also indicates that the goods and services procured are predominantly basic materials and manual and low skilled labour.

Figure 2.8: Mining spending on goods and services along the mining life cycle (Share of life of mine cost, %)



¹ Engineering, procurement, and construction management.

NOTE: Analysis based on expert interviews and quantitative estimates of capital and operational expenditure over the life of a mine. Figures are subject to variation according to the specific metal and type of mine considered. The totals shown for each element of the mine life cycle will therefore not necessarily equal the sum of the individual items below.

Source: McKinsey (2013), Reverse the curse: Maximizing the potential of resource-driven economies.⁶

According to a 2012 World Bank report analysing local procurement in mining in West Africa, the following mining –related opportunities could be realistically seized in the short-to-medium term (these opportunities are shown graphically along the mine life cycle in annex 1):

- Services:
 - » Legal and regulatory services when there is a need for local knowledge
 - » Mining and drilling services (waste haulage, secondary crushing, specialized drilling, sample analysis)
 - » Transport and logistics services
 - » Spare part warehousing
 - » Supply of lubricants
 - » Analysis and testing, including ore samples, water, oil,
 - » Civil works

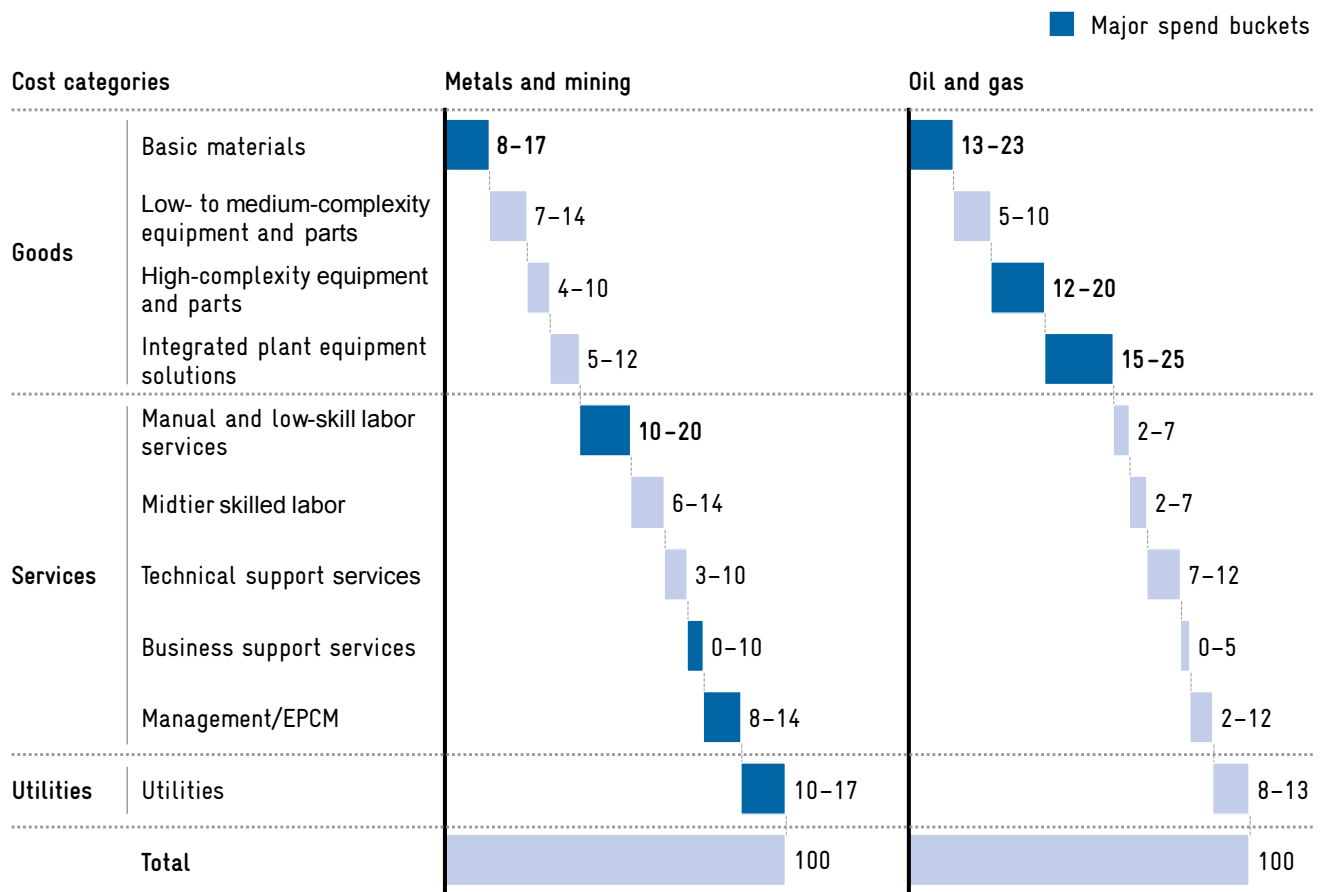
⁶ Exhibit from "Reverse the curse: Maximizing the potential of resource-driven economies ", December 2013, McKinsey Global Institute, www.mckinsey.com. Copyright (c) 2013 McKinsey & Company. All rights reserved. Reprinted by permission.

- » Supply of metal fabrication
- » Mining village management (including cleaning, maintenance, catering, non-hazardous waste management)
- Capital Equipment:
 - » Kilns and furnaces
 - » Plastic products (pipes)
 - » Cement
 - » Assembly of small motors
- Consumables
 - » Tires when there are rubber plantations
 - » Lime
 - » Cyanide, caustic soda, hydrochloric acid, ammonia, and activated carbon
 - » Crucibles

- Non-core goods and services
 - » Food and beverages
 - » Local training service providers
 - » Sample bags and packaging
 - » Uniforms

The spending pattern in the oil and gas sector is more geared towards high complexity goods and integrated plant equipment solution, as can be seen in the figure below. This can reduce the scope of upstream linkages opportunities in developing countries with a low skill base.

Figure 2.9: Difference between mining and oil and gas expenditure over goods and services (Cost breakdown by cost type, %)



Source: McKinsey (2013), Reverse the curse: Maximizing the potential of resource-driven economies.

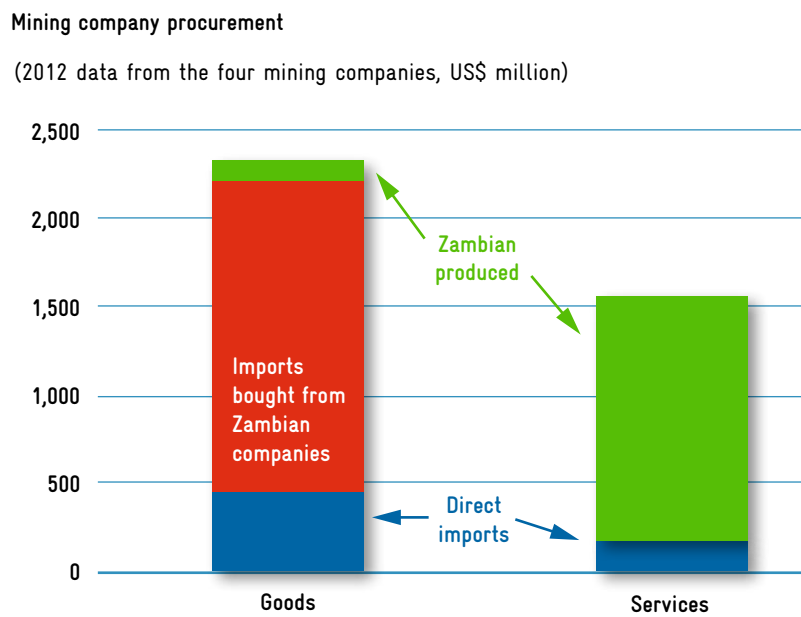
7 Exhibit from "Reverse the curse: Maximizing the potential of resource-driven economies", December 2013, McKinsey Global Institute, www.mckinsey.com. Copyright (c) 2013 McKinsey & Company. All rights reserved. Reprinted by permission.

The potential for upstream linkages in the oil sector is likely to be limited during the exploration and development stages because of the highly specialized and technical nature of goods and services required at these stages (Tordo et al., 2013). The scope for upstream linkages thus tends to be greater during the production stage, as the inputs required are less specialized than during the previous phases. However during the further downstream phases, this potential becomes limited again given the demand for specialized content in inputs. Some temporary opportunities remain in the construction of pipes, pipelines and storage facilities and some more permanent ones in the primary distribution of refined products to customers. The figures in annex 1 set out

the upstream opportunities along the value chain of the oil and gas sector.

The evaluation of whether the local economy has seized such local procurement opportunities should be done with caution. Zambia is a case in point: as shown in the figure below, while most of the mining services are provided by local entrepreneurs, most of the goods are not manufactured in Zambia but imported from abroad through Zambian companies. Therefore, while the mining companies would present substantive local expenses in terms of local procurement, only a small proportion is attributed to goods that are actually produced locally.

Figure 2.10: Procurement of goods and services in Zambia’s copper sector.



Source: ICMM (2014), Enhancing mining’s contribution to the Zambian economy and society.

2.2.1. Literature review and case studies

The value chain literature (Akinlo, 2004; Bwalya, 2006; Larsen et al., 2009; Fessehaie, 2011; Mjimba, 2011; Morrissey 2012; Morris et al., 2012) suggests that local linkages to the African EI sector are “few and shallow” (Hansen, 2014).

This is often the result of upstream linkages being neglected by policy makers. Kaplinsky (2011) suggests two reasons for this negligence:

1. The conviction that the EI sector is an enclave sector (legacy from the theories of the 50’s); and
2. The underestimation of the EI sector’s potential to generate technological spill-overs based on the perceptions that either the sector’s technological content is too high for successful participation in its supply chain or too low to produce spill-overs and enable the creation of a knowledge-based industry.

Kaplinsky refutes the first reason with the argument that the unique specificity of each deposit requires the creation of local skills and technologies. South Africa, Brazil, Angola and Tanzania serve as examples. Local suppliers may also have an advantage over global suppliers because of the lower cost of local knowledge (Ramdoo, 2013). Kaplinsky also debunks the second argument by asserting that the production process requires considerable inputs involving a broad range of skills levels. These range from the provision of basic utilities (water and power), food and office supplies over the provision of services in internet and telecommunication technology (ICT)⁸ and engineering maintenance⁹ to more technological inputs such as *“the assembly and sub-manufacture of the cables link[ing] sub-sea oil wells to surface vessels and to land”*, which are sourced locally in Angola.

Kaplinsky (2011) therefore concludes that despite the widespread perception that the EI sector operates in an enclave model, the potential for upstream linkages when assessing the whole range of inputs required by the project is high. If the country offers reliable, low cost, high quality suppliers, EI companies will prefer to outsource non-core competences creating further opportunities to create upstream linkages.¹⁰

Hansen (2014) suggests that the enclave hypothesis is now outdated, in particular considering the recent change in the dynamics of extractive FDI:

1. Multinationals evolve towards greater outsourcing of their non-core competencies.
2. Multinationals have integrated community-oriented and corporate social responsibility (CSR) strategies as risk-reducing strategies (‘social license to operate’) and see linkages as part of those strategies.
3. Western multinationals are now in competition with firms from emerging markets and increasingly competent local African extractive ‘champions’, enabling African governments to strengthen their bargaining power to require local content and the promotion of linkages.
4. The international development cooperation is increasingly looking at the promotion of linkages from the EI sector

8 Nigeria has built up its ICT sector and its EI source these services locally.
9 Zambia is seen as a successful case study where engineering services are provided locally.

10 Many authors (Attenburg, 2001; Nunnenkamp, 2002; Meyer & Sinan, 2009; Morris 2001) argue that companies will be reluctant to outsource anything that has to do with the companies’ core competencies in order to avoid creating future competitors. Therefore, intra-industry linkages will be less extensive than inter-industry linkages.

The breadth and depth of upstream linkages to a country’s EI sector are dependent on 1) how long commodities have been exploited in that country; 2) the nature of ownership of the lead extractive company; 3) the skills level of local suppliers and the extent to which national institutions support the technological development of local suppliers or its National System of Innovation (NSI);¹¹ 4) local suppliers’ access to infrastructure and finance; 5) the quality of the policy around linkage promotion; and 6) the structure of the sector (Morris et al. 2012, Hansen 2014). Determinants 3-6 are reviewed in more detail below, given that the first two have already been described in section 2.1.

The capabilities and skills of the local suppliers, and the technological support they receive from a NSI

In a report on commodities and development, UNCTAD (2013) found that the local workforce’s low absorptive capacity¹², especially due to a lack of skills, limits the scale of upstream linkages. The report concludes that the impact of FDI in the EI sector on a host country’s development is therefore limited. Fesshaie (2011) finds that low public investment in technological capacities leads African suppliers into a vicious circle of *“low access to investment capital, low technological capabilities to start with, low incentives to adopt new technologies, and high risk that the market will not reward such investment”* (Hansen 2014).¹³

Peek and Gantes (2008) observe that the shortage of skills in the African oil and gas sectors is directly attributable to a combination of scarce educational facilities, weak vocational and technical training, which is not targeted at the EI sector, and the lack of school accreditation. Morris et al. (2012) add that the NSI is often not in synergy with the sector, which lacks industry clusters. *“[Such clusters] contribute to the development of a network between government, universities and foreign and domestic firms that allows a progressive incorporation of domestic firms in the main activities”* (UNCTAD, 2012). As demonstrated on the next page by the case of South Africa, suppliers operating in an industrial cluster benefit from faster knowledge dissemination, reduced

11 Freeman (1995), Lundvall (1992), and Morris et al. (2012) all use the expression of a “National System of Innovation”.

12 The absorptive capacity refers to the capacity of local firms to learn new competencies through linkages.

13 A similar situation is present in Mongolia, where SMEs have little access to finance and are hampered by their inability to invest in better machinery, technology and training to improve their competitiveness and meet the quality standards that would be required to compete with imported goods or in foreign markets. Public investment to promote technological advances of SMEs would go a long way to support linkages to the EI sector by improving the quality to price ratio of Mongolia’s locally produced goods and services. (Interview with GIZ Mongolia, August 2015).

transaction costs, the acquisition of best practices, and increases in competitiveness and innovation capacities (UNCTAD, 2012). The links that are created in industrial clusters also help establish industry-university collaborations aimed at designing educational programmes that serve the needs of the industry (as also mentioned in recommendations E8, G2 and G5). For instance, the Center for Energy Enterprise Development in **Trinidad and Tobago** was established in 2004 to “increase local participation in value-added energy projects, facilitate the expansion in-depth and scope of the local

energy industry, develop business skills in the small and medium enterprises, encourage innovation and foster new thinking, helping entrepreneurs to capture supply chain niches” (UNCTAD, 2012).

South Africa is a case in point to understand the first three determinants of upstream linkage creation (long history of commodity exploitation, local ownership of the lead companies, and the skills, capabilities and technological support given by the South African public-private NSI).

Box 2.2: South Africa’s upstream supplier sector

South Africa’s large-scale minerals exploitation started 150 years ago with the discovery of diamonds, followed by gold and platinum in the 1870s. As a result, South Africa has built up significant expertise in the mining sector and boasts the most developed mining and mining supply industry in Sub-Saharan Africa.

In the early years of the mining sector, South African policies were geared towards two main goals: 1) providing a favourable environment for mining investors, notably by keeping costs, such as wages, low and financially supporting their technological and training efforts; and 2) encouraging upstream linkages by protecting the domestic industry through tariffs which lasted until the end of the Apartheid regime in 1994. Those policies were combined with an early realisation by mining entrepreneurs that the specificity of the geology of the country’s mining deposits, which is characterized by great depth, necessitated advanced technologies and systems.

Over time, technological capabilities were also strengthened as a result of (Kaplan, 2011):

1. The scale and longevity of South Africa’s mining sector, which provided the possibility of amortizing any investment in technology over time.
2. Economies of scope due to the variety of minerals.¹⁴

3. The structure of the mining industry, which was dominated by large mining houses that cooperated e.g. by jointly financing technological improvements.
4. The development of a NSI in close collaboration with the mining industry. The development of special expertise in deep gold and platinum mining was incentivized by the cooperative research institute of the mining industry (COMRO). This industry association undertook several research and development (R&D) initiatives in the 1960s to develop technologies that were adapted by local equipment manufacturers for deep gold mining, which led to the development of hydraulic equipment. COMRO also outsourced some of its R&D to equipment suppliers, other research organizations and South African universities (Progue 2008).
5. The development of the industry in geographical clusters concentrated east of Johannesburg and was characterized by frequent interactions between mining producers, specialized manufacturers, input providers, agents and distributors. The cluster included companies specializing in metallurgy, machinery, electrical equipment, and construction activities (Walker 2005).

The share of patents related to mining technology is much higher in South Africa than in other resource-rich and technologically advanced countries.¹⁵ In fact, the country has become a world leader in supplying deep level mining projects. South African export products include “*spirals for washing coal; pumping up water from deep levels; hydropower; tracked mining; underground locomotives; ventilation; shaft sinking; turnkey new mine design and operation; and many others,*” (Morris et al. 2012)

¹⁴ The same core capabilities were required by mining projects extracting different commodities, thus providing the opportunity to realize economies of scope and reducing the projects’ development costs.

¹⁵ According to the United States Patent and Technology Office (USPTO), the average share of patents related to mining technology in South Africa between 1976 and 2006 stands at 4.5%, compared to 0.5% in the U.S., 1.9% in Canada and 1.3% in Australia.

South Africa’s long history of mining and its successful development of upstream linkages as described in the case study demonstrates how a mature mining sector as well as targeted policy interventions and support mechanisms, such as a NSI, can contribute to establishing a globally competitive supplier network possessing specialized expertise regarding the country’s unique geological characteristics.

An acknowledgment of the success factors through which South Africa historically promoted and developed upstream linkages to its mining sector is unfortunately missing in the current government’s policy to maintain South African suppliers’ comparative advantage. According to Kaplan (2011), in order to keep a sustainable comparative advantage, South Africa’s supply base is in dire need of government-supported investments in R&D, tertiary education institutions and science councils. These investments are necessary for South Africa to keep up with rising competition in manufacturing from Asia as well as in knowledge and innovation (mainly from Australia). However, the government is focusing most of its efforts on downstream beneficiation. The National Industrial Policy Framework and the Industrial Policy Action Plan ignore the sectors producing mining equipment and offering related services (Morris et al., 2012).

Local suppliers’ access to infrastructure, finance and information

While the major EI companies may be in a sufficiently strong financial position to be able to construct, operate and maintain infrastructure necessary to make the project viable, local suppliers are not. Local suppliers therefore often severely suffer from a lack of adequate power, transport, water, and/or ICT infrastructure.

Access to finance is crucial for suppliers with limited working capital. This access to finance is all the more important if suppliers are subjected to unfavourable tax and customs duties, currency risks (e.g. if contracts are denominated in U.S. dollars), and transactional risk (Hansen, 2014). In Azerbaijan, BP set up a Supplier Finance Facility of \$15 million over eight years to provide financing to suppliers, with support from the IFC. BP (40%), the IFC (40%) and a local bank holding (20%), financed the Facility jointly (Also see recommendations E10, G6, D6).

In addition to access to finance and adequate infrastructure, local suppliers benefit from access to information about procurement opportunities. Governments, companies and international development cooperation have often overcome this issue by putting together a database describing procure-

ment contracts, EI companies’ ongoing needs and small and medium-sized enterprise (SME) capacities, as explained in the Box below and recommendation G6.

Box 2.3: Dealing with access to information

1. In Chile, the Industrial Association of Antofagasta, Xstrata, BHP Billiton, and Barrick developed the Goods and Services Supplier Company Classification System, which provides an up-to-date database of suppliers and contractors (World Bank, 2009).
2. In Chad, the IFC helped compile a supplier database of over 1,000 vendors for ExxonMobil (World Bank, 2012).
3. In Kazakhstan, oil and gas companies are required to upload all procurement information and documents to the Kazakhstan Contract Agency Register. Brazil has a similar system with the Site Opportunities Supply Chain of Petroleum and Natural Gas, launched in 2009 (McKinsey, 2013).
4. In Guinea, Rio Tinto and the IFC set up a database of over 400 SMEs and an enterprise center providing business services in the city of Beyla. Both initiatives facilitate the communication between local suppliers and Rio Tinto (IFC, 2015).
5. In Senegal and Côte d’Ivoire, the Subcontractor and Partnership Exchanges, a joint effort by the state, the private sector and UNIDO, maintain a database containing 450 and 700 SMEs respectively (World Bank, 2012).

The quality of local content policy

According to Morris et al. (2012), the creation of upstream linkages is included in the national development visions of Angola, Botswana, Gabon and Nigeria, while, by 2012, this was not the case in Ghana, Zambia, Tanzania and South Africa.¹⁶ Even when countries have a vision, it often only encourages local ownership instead of local value addition: this can result in a situation of “broad” linkages with very little depth, leading to “the localization of the import function”¹⁷ (Morris et al., 2012).¹⁸

16 However, Ghana and Tanzania have developed petroleum laws and regulations, respectively, in 2013 and 2015, with the objective of clearly defining their vision for local content in the petroleum sector (see Local Content - Ghana Petroleum - CCSI - June 104 and Local Content - Tanzania Petroleum - CCSI - July 2015).

17 The promotion of local ownership often leads to the creation of front companies that import goods from abroad instead of producing goods locally and contributing to local manufacturing skills. This leads to “shallow” linkages.

18 For a discussion on this issue in the context of Nigeria, see Ovadia (2013b).

Box 2.4: Nigeria’s local content development

- Nigeria discovered commercial quantities of oil in 1956 but had to wait for the end of the civil war in 1970 in order for the oil sector to play a significant role. Along with the relatively long history of the oil sector, there has been a long history of local content policy to deepen upstream linkages, which include:
- The Petroleum Act from 1969, which protects indigenous Nigerian firms and promotes human capacity development. The Production Sharing Contracts of 1991 and 1993, which encourage local procurement even if it is at a higher cost than international procurement.
- The 2005 directives, which mandate the use of local services and low-tech on-shore goods and services supplied by indigenous firms.
- The Nigerian Content Act of 2010, which is dedicated to local content and promotes value added by Nigerian firms.
- The 2020 Vision, which sets targets of 35.5 % of local content in 2010 and 70% in 2013.
- The First Implementation Plan (covering the periods 2010–2013), which promotes the participation of the private sector in both upstream and downstream linkages as well as the growth of national value added (Morris et al., 2012).

In addition to the regulations, post-civil war Nigeria created a NSI. In 1973, it established the Petroleum Technology Development Fund to advance petroleum technology education in six national universities and conducted several programmes in design engineering and welding. Moreover, the government established the Petroleum Training Institute in the Delta State to provide low and mid-level skills training in engineering aimed at the petroleum sector. Later, the National College of Petroleum Studies in Kaduna was set up in 1995 to train senior and executive-level skills so as to enable local personnel to take on corporate and technical responsibilities.

In addition, the Nigerian National Petroleum Corporation (NNPC) and all other major oil companies are required to finance training programmes and scholarships (Oyejide and Adewuyi (2011)). Consequently, a supply of highly trained Nigerian engineers, geologists and geophysicists has emerged, some of whom have established private oil prospecting and services companies.

Nigeria has also recognized the responsibility of the government to implement and monitor local content requirements and policies. The National Content Act established the Nigerian Content Development and Monitoring Board (the “NCDMB”), which is in charge of developing procedures that will guide, monitor, coordinate and implement the provisions of the Act. The Act requires the NCDMB to manage the Nigerian Content Development Fund (NCDF), which was established to assist in the implementation of the Act by guaranteeing lending to Nigerian service companies as well as to infrastructure and training projects and is financed by 1% of the value of every contract awarded. In 2014 the fund reached \$350m and it is projected to reach \$700 million over the next five years.¹⁹ The NCDMB also established the Nigerian Content Consultative Forum as a platform for information sharing and collaboration in the Nigerian oil and gas industry.

All of those measures seem to have had some success since local content rose from 3-5% in the 1970’s to 20% in 2004 to 39% in 2009 (Morris et al., 2011). NCDMB has released that service companies have invested \$5bn²⁰ in the last four years thanks to the NCDF.²¹ This investment has led to the creation of 38,000 jobs (Ramdoe, 2015). Progress has been made especially in the fields of fabrication and construction, well construction and completion, transportation, control systems, design and engineering, and ICT. Among those areas, the fabrication of structures and parts is the most locally grounded. Many of the suppliers in this sector have technical agreements²² with oil companies, local research centres and universities, which have enabled knowledge and technology transfer and information exchange (Oyejide and Adewuyi, 2011).

19 <http://www.natlawreview.com/article/nigeria-local-content-update-oil-gas-industry>
 20 Nigerian annual petroleum revenues are generally estimated to be \$3-\$5 billion. This would make local content roughly equivalent in significance to petroleum revenues for Nigeria (Ovadia, 2014)

21 Ibid.

22 The Nigerian Content Act requires oil operators to submit an annual plan “setting out a programme of planned initiatives aimed at promoting the effective transfer of technologies from the operator and alliance partners to Nigerian individuals and companies.”

Morris et al. (2012) find that upstream linkage policies are often inconsistent or even contradictory. For example, policies granting duty free exemptions to (foreign) EI companies but not to domestic suppliers incentivise the import of goods and services and may crowd out local sourcing. Policies are often also not backed by incentives and if they are, monitoring tends to be inadequate due to a lack of resources, institutional capacity and/or political will. Kaplinsky (2011) notes that the agenda of upstream linkage policies has often been “passive”, i.e. limited to the establishment of mandatory local content targets on foreign-owned companies. It stands in contrast with the agenda of downstream linkage policies, which frequently involves heavy commitments of government financial support.

The literature concurs that there is both a tremendous potential for upstream linkages and a high risk of implementing ill-suited policies that fail to foster market driven linkages which are in the mutual interest of both the host country and the EI sector. Such policies may not only generate inefficiencies and be costly to implement, but may also slow down linkage creation and make the linkages “shallower” while reducing the resource rents from EI projects.

Successful policies to cope with all the issues mentioned above can be clustered into four non-exclusive areas (UNCTAD, 2010a, Hansen, 2014): (1) the strategic and selective attraction of FDI depending on its potential for linkages;²³ (2) consistent linkage policies and institutions focused on the implementation of linkage policies (see also recommendation G1); (3) the development of absorptive capacity in the local industry (see also recommendation G4); and (4) improving the general investment climate (see also recommendation G2). A 2012 World Bank report adds a fifth area, namely regional integration policies. The report highlights that poor *regional integration* increases the costs associated with intra-regional procurement even if the demanded goods and services are available. In **Senegal**, for example, water tests required for the mining process used to be done in Ghana, but the long journey (due to deficient cross border infrastructure and delays at the border) makes the water results inaccurate, so now water testing is done in the Netherlands. Thus suppliers miss regional market opportunities and the possibility to build on economies of scale and scope to develop their capacities (see recommendations G9). The case study on the previous page illustrates how **Nigeria** has targeted its local content policy and created dedicated institutions to implement it.

The **Nigerian** case study illustrates the country’s vision of developing local content and increasing it over time. According to Morris et al. (2012), the Nigerian government is one of few African governments that had an early focus on local content. Emphasizing local value added rather than local ownership has facilitated the development of upstream linkages. In the National Content Act Nigerian content is defined as “*the quantum of composite value added to or created in the Nigerian economy by a systematic development of capacity and capabilities through the deliberate utilization of Nigerian human, material resources and services in the Nigerian oil and gas industry*”. (See recommendations G3,G5,G6). Such a definition also involves the challenge of adequately measuring local content targets. Ovadia (2013) notes that the NCDMB still needs to address the fact that concrete definitions and guidelines for measuring Nigerian content are absent; without these, the NCDMB has to rely on informal, opaque and discretionary procedures with regard to monitoring local content.

Furthermore, to sustain its advances in local content, Nigeria needs to tackle a few challenges that local suppliers still confront. Oil companies’ active supplier development programmes do not extend to the second or farther tiers of suppliers. Suppliers complain about high import tariffs and taxation (which are often alleviated for foreigners) hurting their participation in the oil and gas sector. Transportation and power supply are inadequate for the development of a more robust supply chain. Last, the supply chain’s technological content needs to be upgraded in order to serve the more demanding deep-water fabrication.

Similarly, the recent reform of the petroleum sector in Mexico also displays the desire to promote a local content policy around value-added, to address the measurement issue and to ground it within a strategic industrial policy (see box 2.5):

²³ Blomström et al., (2003) explains that developed countries would use subsidies to attract a particular type of investors but low income countries are left with tax and regulatory exemptions as policy options.

Box 2.5: Mexico’s approach to local content as of 2014

In 2014, Mexico passed the Hydrocarbons Act, which reformed the country’s approach to the hydrocarbons sector and to the promotion of local content. The Act mandates the Ministry of Energy to develop a methodology on how to measure and monitor the implementation of local content, define an industrial strategy for the hydrocarbons sector, create a national registry of domestic suppliers to identify their development needs, and create an advisory board to help formulate policies fostering the development of domestic suppliers.

The methodology published by the Ministry of Economy in November 2014 defines national content as “a percentage that represents the value in Mexican pesos of the goods, services, work force (labor), training, transfer of technology and physical infrastructure on a local and regional basis, from the total value in Mexican pesos of such concepts as defined in this Methodology”.

Structure of the sector

The chain of contractors involved in commissioning a mine or an oil field plays a role in determining the breadth of linkages. Construction is generally sub-contracted to specialized construction and installation companies that themselves sub-contract companies with which they have established long-term relationships. Investment contracts do not always impose local content requirements on subcontractors engaged by the investor or company and, even if they do, contractors might not be diligent in monitoring local content requirements. Another reason why companies do not maximize the use of local suppliers arises when the mine or oil well is located in isolated areas or in harsh conditions. In those circumstances “supply chain management staff and the purchasing function characteristically work on short and intensive work cycles” (Hansen, 2014). There is no time to create the long-term personal relationships with local suppliers that are necessary for the successful development of upstream linkages.

Supporting policies by government, companies and international development cooperation

Apart from focusing on local content policy, governments can also rely on broader policies to target upstream linkages. Australia’s approach is a point in case, as it has developed a framework enabling suppliers to seize procurement opportunities domestically and abroad. This framework applies to both the mining and petroleum sectors.²⁴

Box 2.6: The Australian Industry Participation Framework

Australia has a long mining history and has created strong upstream linkages with local and regional suppliers. However, due the competition of low cost supplies from the Asian economies, an increasing number of Australian manufacturing and service companies have closed or moved offshore. To help its local manufacturing and service sectors compete for procurement and supply contracts in large-scale projects, the Australian Government – at the commonwealth, state and local level – has implemented a number of “soft approach” measures.

The Australian Industry Participation Framework (AIP National Framework) was signed by Commonwealth, State and Territory Industry Ministers in April 2001 “to promote, develop and maintain a sustainable Australian industry capability by encouraging competitive Australian industry participation in investment projects.”²⁵ The key principle of the AIP National Framework is to ensure that the Australian industry and especially SMEs have the opportunity to participate in major investment projects in Australia and overseas. This is achieved through the early identification of opportunities and the facilitation of local participation through capacity building. The Australian Jobs Act 2013 further clarifies the requirements under the AIP Framework. Project proponents carrying out a project with a capital expenditure of \$500 million or more are required to meet the following criteria:

- Notify the AIP Authority of a potential project;
- Complete and submit an AIP plan that outlines how the project will provide opportunities for capable and competitive Australian businesses to bid for goods and services;
- Once the AIP plan is approved, demonstrate and report compliance with the plan for the duration of the project.²⁶

The Industry Capability Network (ICN) and the Supplier Access to Major Projects (SAMP) support the AIP National Framework. The ICN is responsible for funding and promoting Australian SMEs’ participation in major projects and communicating new business opportunities. The SAMP funds the ICN to work with project developers to identify supply opportunities for capable and competitive Australian companies both within the country and abroad.

²⁴ Also see CCSI’s local content profile on Australia, which is available at: <http://ccsi.columbia.edu/files/2014/03/Local-Content-Australia-Mining-and-Petroleum-CCSI-4-December-2015.pdf>.

Australia's very recent case study illustrates the types of policies that may help to create local procurement opportunities for local suppliers in addition to the local content requirements imposed on the private sector to prevent a well-established service industry from relocating abroad (see recommendation G3).

Apart from government policy and support mechanisms, the EI companies and international development cooperation both have an important role to play in creating upstream linkages. The **Madagascar** case studies below illustrate these two actors can work together to increase local procurement.

Box 2.7: Partnerships between companies and international development cooperation in Madagascar²⁷

Rio Tinto and GIZ:

Rio Tinto (80%) and the Malagasy government (20%) jointly own QIT Madagascar Minerals S.A. (QMM) – a \$940-million mining operation that started production in 2009. To develop an effective local suppliers development programme, Rio Tinto entered into a strategic alliance with GIZ in 2013.

GIZ and QMM designed four activities to promote upstream linkages, including:

1. The development of a preferential procurement policy, which considers the location and ownership structure of the suppliers;
2. The creation of a cross-departmental local content committee, which regularly convenes directors from operations, procurement, finance and community development;
3. The identification of the following four low-value/low-risk areas in which local supply can make a short-term impact: facility maintenance and food services, vehicle repairs, waste management and fabrication of bags used to transport sands; and
4. Building the capacity of local SMEs via a Regional Business Centre (CARA), which focuses on the development of business skills, access to capital, quality standards and responding to tenders.

In 2013, QMM spent around US\$ 12 million in purchases from local suppliers and organized training programme for 335 participants. QMM also established a database of 900 suppliers (CSR, World Bank, 2015).

IFC and Ambatovy

The Ambatovy mining operation is a \$5.5 billion joint venture composed of Sherritt International, Sumitomo Corporation, Korea Resources, and SNC-Lavalin. It is the world's largest nickel and cobalt operation, and Madagascar's biggest investment. In order to realize its commitment to local content, Ambatovy, in collaboration with the IFC and Training Management Africa, created a business training centre, which provides vocational training to local SMEs, in 2008. The company also supported the construction of three bulk purchasing centres and established a database listing 3,500 potential local suppliers.

In 2013, Ambatovy spent over \$400 million on local goods and services, which accounted for half of its total procurement. Specifically, it purchased over 1.5 million kilograms of local fruits, vegetables and dry foods from regional centres supplied by over 3,000 small-scale farmers, and bought over 13,000 wooden pallets, 20,000 timbers and 9,000 uniforms from local suppliers.

25 Australian Department of Trade and Industry website, available at: <http://www.industry.gov.au/industry/IndustryInitiatives/AustralianIndustryParticipation/Pages/default.aspx>
 26 Further information on developing an AIP plan, along with supporting documentation, is available at www.industry.gov.au/aip. The Australian Jobs (Australian Industry Participation) Rule 2014 (the Rule) was registered on 6 February 2014 and is published on ComLaw. The Rule details notification obligations, categories of key goods and services, and compliance report requirements as well as the functions of the AIP Authority and exceptions to the AIP plan requirements.
 27 <https://www.giz.de/en/downloads/giz2014-fr-alliance-strategic-rio-tinto.pdf>

These case studies illustrate that strategic alliances between companies and development partners can help leveraging each partner's expertise. Actors of the international development cooperation have experience in private sector development and support of SMEs, and the miners know their companies' procurement needs. Both are required to devise effective local content programmes (see recommendations D5,D7).

Addressing the gender bias in upstream linkage creation

The indirect employment opportunities created around the EI sector can be particularly significant for women. While direct employment opportunities for women at mine sites is only slowly starting to increase as a result of focused efforts by companies and governments,²⁸ indirect employment figures already suggest a proportionally higher participation of women. Mines often outsource "catering, laundry, clothing, and uniform supply and repair, agricultural produce, financial services and clerical support", jobs that are usually done by women (World Bank, 2009). Apart from gender equality, increased female income is correlated with rising expenditures on health, education, and nutrition. This provides a strong argument for companies to incentivize female upstream employment. According to the World Bank, this could be achieved by "giving preference in bid evaluations for women's business or businesses with a large proportion of women employees" or requiring minimum quotas of female employment. For instance, in South Africa, Lonmin awarded "a 45 million rand contract to three companies managed largely by black South African women for the conversion of single-sex mining hostels to family housing units" (World Bank, 2009). However, often businesses owned or operated by women have even less access to finance than their male counterparts. This is particularly a problem in Africa. An IFC programme dedicated to encouraging African banks to make loans to women's businesses has been rolled out in Nigeria, Tanzania, and Uganda (IFC, 2008).

Moreover, governments, companies and development partners can help increase the organizational capacity of women by providing support to women's organizations, e.g. in the form of trainings on organizational skills, funding, budgeting and management. Helping women's capacity to support each other can lead to further empowerment (World Bank, 2009).

However, a partnership between Rio Tinto and the IFC in Guinea has shown that encouraging the participation of women among the suppliers is not without challenges.

Box 2.8: Rio Tinto, IFC and Women Suppliers in Guinea

Rio Tinto and the IFC launched the Local Supplier Development Project in late 2012 to support Rio Tinto's efforts in building a strong local supply chain for its Simandou project in Guinea. While the programme has been relatively successful in terms of the number of SMEs trained, performance improvement and the number of local SMEs working with Rio Tinto, the project has experienced limited success with regard to the inclusion of women, even though this was a key component of the project.

The IFC concluded that if a programme wants to appeal to women, it needs to specifically target women in its advertising and marketing campaigns, hold events for women only and design training curricula containing modules that address woman entrepreneurship needs in particular (IFC, 2015).

While increased access to jobs directly or indirectly linked to the EI fosters the social and economic empowerment of women, the literature explains that an "explicit focus on hiring women" has sometimes created tensions in families and communities by clashing with cultural and social norms. Those tensions might be exacerbated if unemployment among men increases as a consequence of these programmes. Moreover, to compensate for the absence of working women at home, families may require the children and particularly girls to help with domestic tasks instead of going to school (World Bank, 2009).

28 Worldwide it is extremely rare to find any EI companies with higher than 10% female participation, with many being less than 5%." However, lately, many EI companies are focusing their efforts on hiring more women. In Newmont's mining operations in Australia, 30% of new hires in 2007 were women, while in South Africa companies are making strong efforts to achieve the 10% target that the government has imposed (World Bank, 2009, IFC, 2015)

Box 2.9: The World Bank's Gender and EI Programme

The Gender and EI programme works with governments, communities and companies to better understand and address the gender dimension of EI. It has gathered knowledge through research, analyses, and publications in order to help mainstream gender in policy and operational activities. The resources of the programme include a factsheet and in-depth publications on the relation between gender and the EI; a study and toolkit on gender and artisanal small-scale mining; guidance notes on mainstreaming gender in mining; and detailed country-specific case studies of gender and mining in Peru, Tanzania and Papua New Guinea; a variety of presentations and a cartoon calendar to raise awareness about gender and mining issues that are often distributed to government partners. With the Japanese Social Development Foundation, the Programme has provided women in mining-affected communities with training in vocational skills, business skills, financial literacy, and basic literacy and numeracy. The Programme is also launching a new initiative on combating sexual and gender-based violence in mining-affected territories (GIZ, 2014).

Addressing human rights in upstream linkage creation

EI companies have a corporate social responsibility to respect human rights. This responsibility is twofold. It requires EI companies to (1) “avoid causing or contributing to adverse human rights impacts through their own activities, and address such impacts when they occur”; and (2) “seek to prevent or mitigate adverse human rights impacts that are directly linked to their operations, products or services by their business relationships, even if they have not contributed to those impacts” (UN Guiding Principles on Business and Human Rights (II.B.13); 2011). “Business relationships” in this context are understood to include, among other things, relationships between EI companies and suppliers in their value chain. So, in addition to ensuring that their operations comply with international human rights standards, EI companies need to ensure that any contractors they engage or suppliers from which they are procuring goods or services are complying with human rights.

Human rights grievances related to contract workers or suppliers can occur in a range of activities related to backward linkages. Examples include contract work related to drilling or seismic testing for oil and gas operations, on-site construction contract work, or the working conditions of

suppliers' employees or contractors. Although they are not the EI companies' employees, if any contract workers or supplier workers or contractors are provided with poor living and housing conditions in worker camps or are not paid a living wage, or if any on-site contractors' staff are subject to poorer employment conditions than EI company employees and lack access to any grievance mechanism, the EI company's responsibility to respect human rights is in violation (European Commission, 2012).

2.2.2. Lessons learned from the literature and case studies

While some of the determinants highlighted above, such as the history of EI in a particular country, the ownership of the EI companies, or the structure of the sector are difficult to influence, other determinants, such as local suppliers' access to infrastructure and finance, the robustness of the NSI and the quality of the local content policy, can be improved and should be targeted by all stakeholders genuinely interested in expanding the scope of upstream linkages.

Governments should devise a local content policy that is realistic, increases in ambition over time, seeks to increase value added rather than local ownership requirements and monitors or enforces the achievements through dedicated institutions (herein, **Nigeria** and **Australia** can serve as good examples). Companies should develop a local procurement plan for the lifetime of the project. Companies and governments should come to an agreement around this plan to carry it forward together with complementary interventions. Development partners can support this process by supporting the convening process and acting as neutral brokers. Structural gaps that prevent local suppliers from expanding their capacity, including such factors as poor infrastructure, lack of access to finance and limited technological support, need to be addressed (as demonstrated by the cases of **South Africa** and **Australia**). The case of South Africa in particular highlights the importance of continued governmental support of innovation, R&D and the development of capabilities to ensure that the supply chain is capable of seizing opportunities for upstream linkages. Bridging those gaps requires resources and should be a joint undertaking between the government, the companies and international development cooperation. Last, upstream linkages can exacerbate gender inequality as well as compromise the EI's company responsibility to respect human rights. These risks should be anticipated and addressed and at worst mitigated through targeted interventions.

Table 2.1: Summary of key characteristics of upstream linkages

BENEFITS	<ul style="list-style-type: none"> - Indirect job creation, which is larger than direct job creation. - Positive impact on the knowledge and technology linkage and the basis for horizontal linkages.
DRAWBACKS	<ul style="list-style-type: none"> - Non-market-driven linkages will be resisted by companies. - Takes time to develop and requires commitment by all stakeholders.
COMMODITY SUITABILITY	<ul style="list-style-type: none"> - Precious metals have short exploitation cycles, making them less attractive for upstream linkages. - Oil and gas require sophisticated development processes that are often not accessible with the level of skills available in developing countries.
REQUIRED INFRASTRUCTURE AND SKILL LEVEL	<ul style="list-style-type: none"> - Oil and gas projects require higher skills to participate in the production.
EMPLOYMENT	<ul style="list-style-type: none"> - Multiplier is said to be 1 to 4 for indirect job creation in mining and 1 to 3 in oil. However, these numbers should not be generalized given that they are very context specific.
GENDER	<ul style="list-style-type: none"> - An increasing number women are employed in upstream industries in sectors such as catering, laundry, clothing, uniform supply and repair, agricultural produce, financial services and clerical support.
MAIN POLICY MEASURES	<ul style="list-style-type: none"> - <u>Coherent vision, strategy and dedicated institutions</u> - <u>Carefully drafted local content policies and regulations</u> - <u>Targeted support to SMEs</u>
RECOMMENDATIONS (CHAPTER 4)	<ul style="list-style-type: none"> - EI Companies: 1,2,3,4,6,7,8,9,10 - Governments: 1,2,3,4,5,6,8,9,10 - Development cooperation: 1,2,3,4,5,6,7,8,10

SWOT Analysis for upstream linkages:

Strengths (internal):

1. Companies may be interested in outsourcing their non-core business functions and creating further upstream opportunities.
2. Companies want to maintain their social license to operate. Employing locals or nationals indirectly through upstream linkages may increase public support for the project at the local or national level.
3. Case studies show that with the right combination of initiatives, linkages can be fostered. While these should not be replicated without taking the local context into account, valuable lessons can be learned from past experiences when designing programmes to strengthen upstream linkages.

Weaknesses (internal):

Upstream linkages require:

1. Access to adequate infrastructure
2. Access to finance
3. A well-educated labour force
4. A well-designed local content policy with resources to support it
5. Time to develop

Unfortunately many resource-rich developing countries that have only recently started exploiting natural resources lack all five of these requirements.

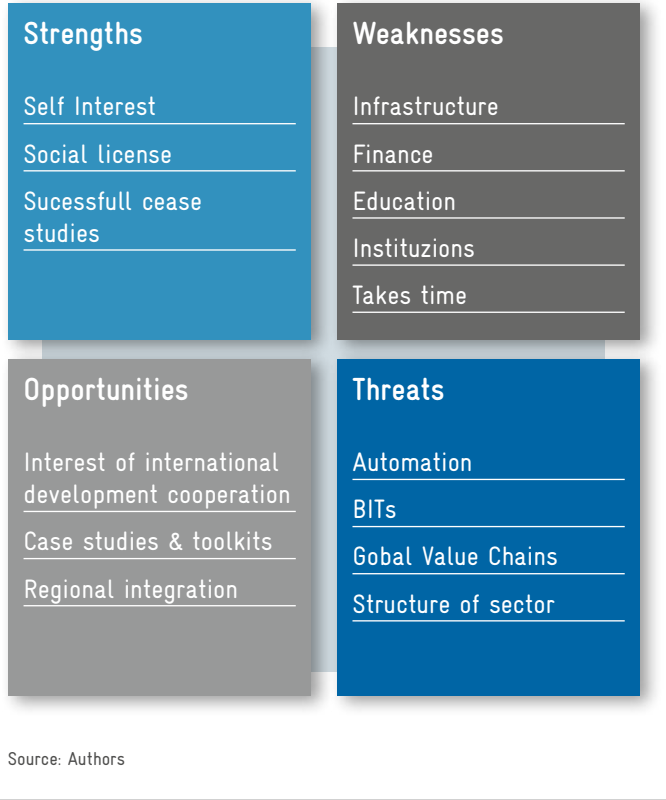
Opportunities (external):

1. There are development partners interested in this area.
2. There is an increasing amount of literature and guidance around this topic.
3. Regional integration improves the business case for local and regional procurement.

Threats (external):

1. The automation of many mine and oil field functions will further limit the scope of low skill linkages (see Chapter 3).
2. A growing body of investment treaties restrict the policy space for local content (see Chapter 3).
3. Global value chains require specialization and innovation, which few countries manage to do (see Chapter 3).
4. The structure of the EI sector does not always facilitate upstream linkages: contractors might not impose local content requirements on their subcontractors.

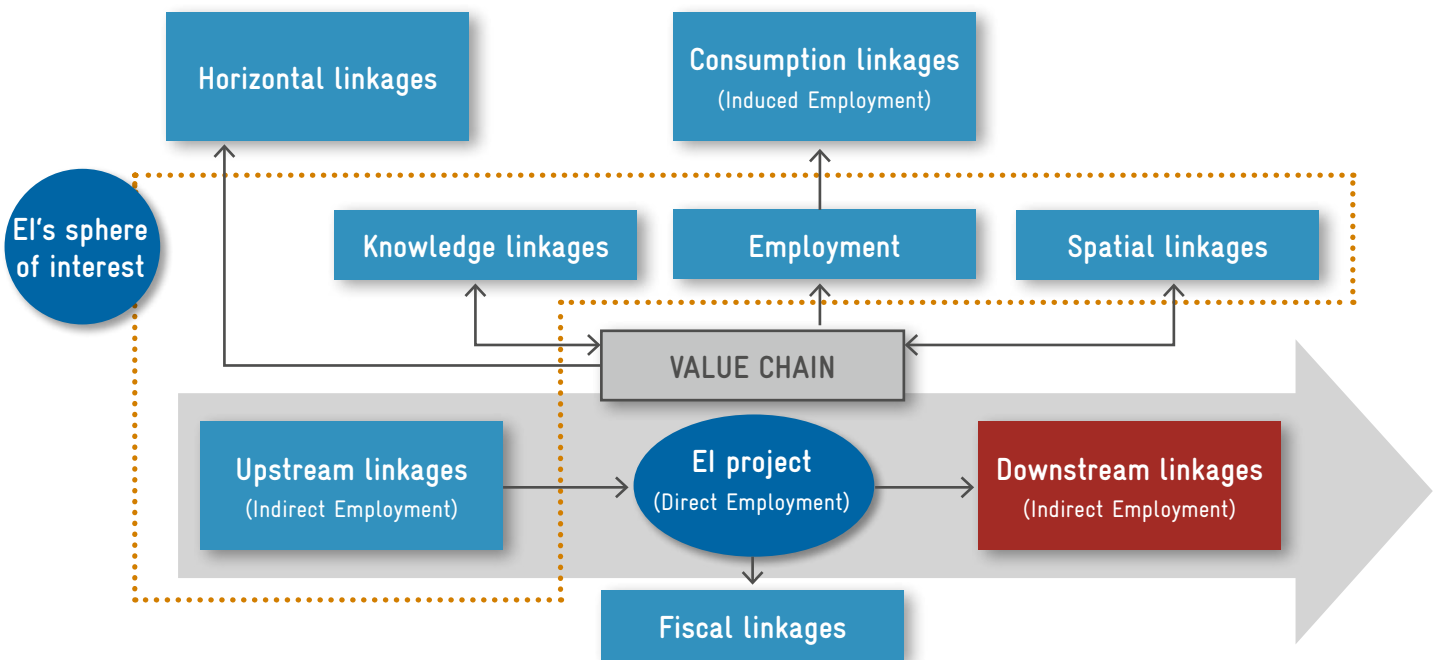
Figure 2.11: SWOT Analysis for upstream linkages



2.3 Production Linkages: Downstream/ Forward Linkages

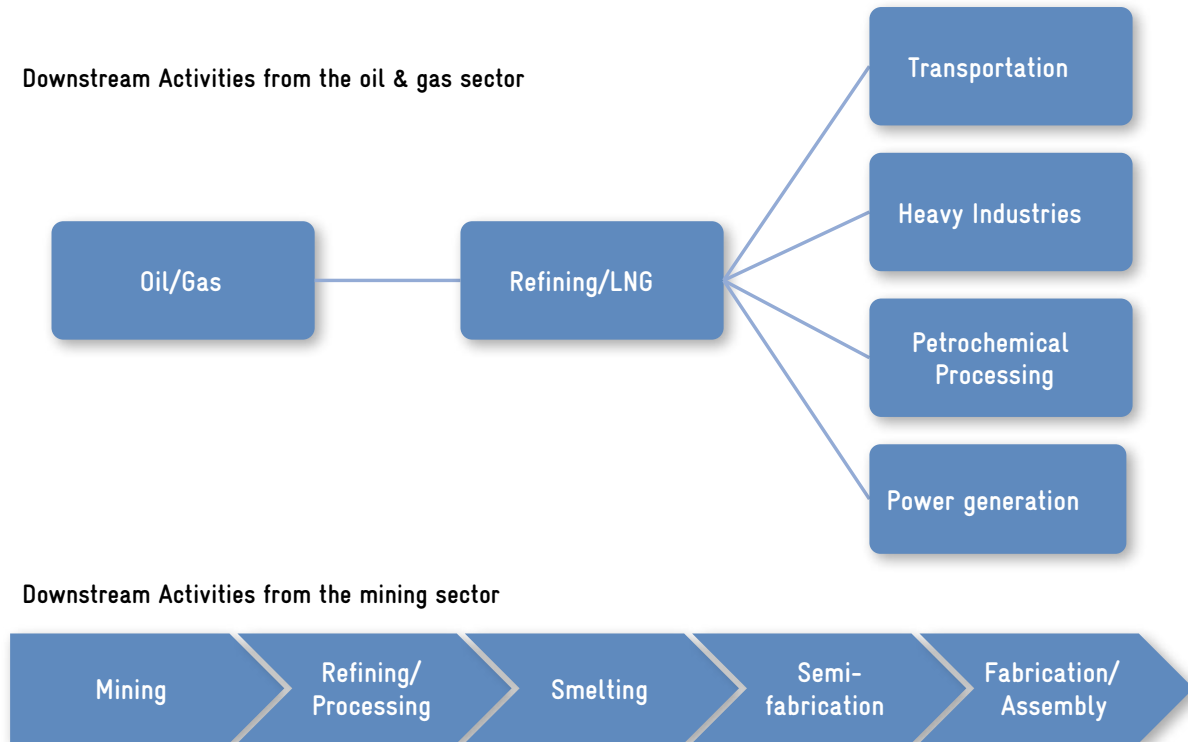
Downstream or forward linkages relate to the processing, beneficiation and value addition of the extracted commodities. While these processes vary by commodity, the figure below illustrates what downstream activities in the mining and oil & gas sector may entail.

Figure 2.12: Downstream linkages



Source: Authors

Figure 2.13: Typical EI value chain

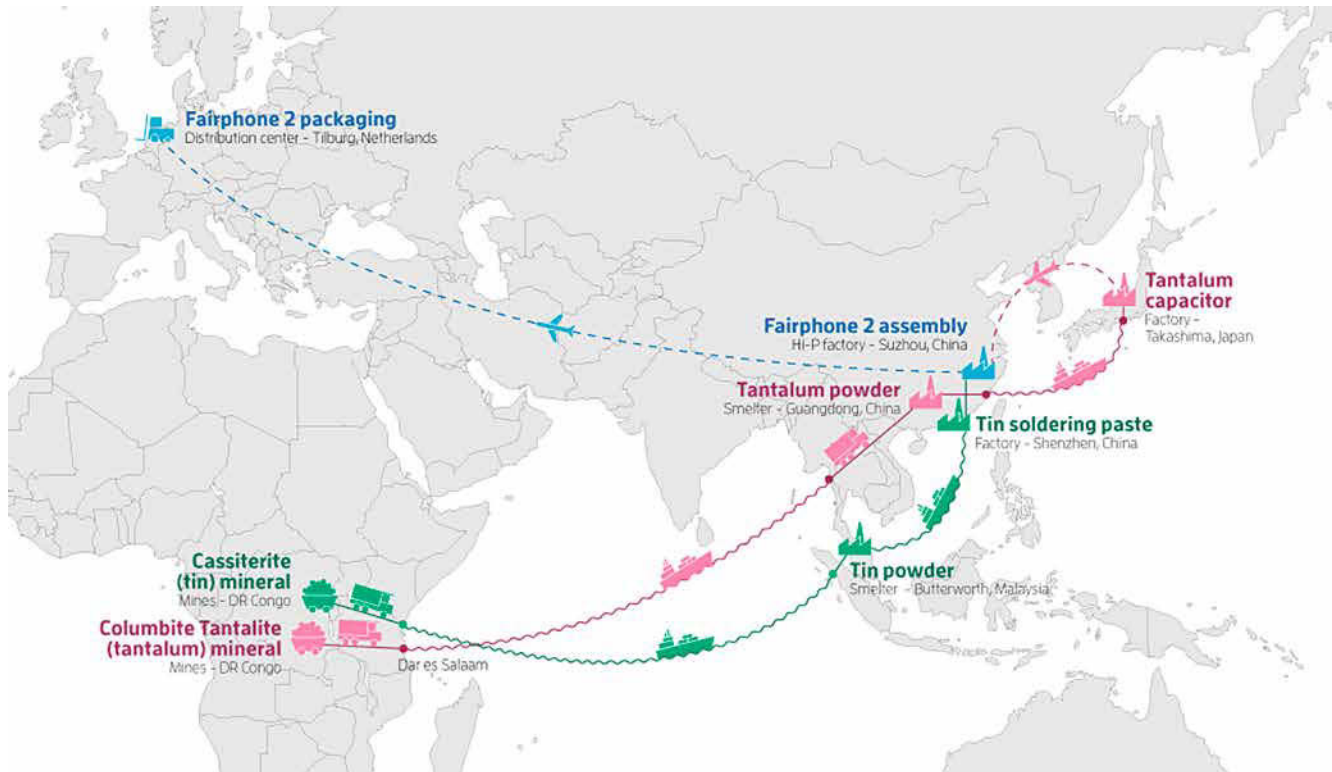


Source: Authors

The value chain of oil and gas starts at the well. After being extracted from the ground the oil/gas needs to be refined into various products such as methane, liquefied petroleum gas, propylene, gasoline, jet fuel, diesel and sulphur to name a few. These products are used for power generation, transport, and as inputs in the heavy and petrochemical industries. The mining value chain starts with the rocks containing the mineral being extracted in an open pit or underground mine. The rocks are then crushed and ground before being beneficiated through separation, concentration and filtration methods. These methods increase the mineral content to the point where they can be smelted and transformed into ingots, cathodes or other forms that feed into the semi-fabrication sector. There may be many additional steps and stages within the semi-fabrication and fabrication process before the extracted resource reaches the end user in the form of a product.

Depending on the commodity and the quality of the ore, refining and processing (beyond crushing and grinding) may be geographically bound. For example, iron ores with a high iron content (above ca. 60% iron), which are also called 'direct shipping ore' do not need to be beneficiated prior to being used as an input in blast furnaces, whereas lower grade iron ores do go through a refining and beneficiation process prior to being shipped, irrespective of any linkage policy. Because of the high transport costs associated with transporting low-grade iron ore or coal this downstream process is locked to the location of production. Similarly, gas destined to be sold on overseas markets far from the gas field has to be liquefied prior to transport, a process that reduces the volume to 1/600th of the natural gas in its gaseous state. The downstream activities, beyond refining/processing in the case of bulky minerals and beyond liquefaction in the case of gas, are not geographically bound. For instance it is not uncommon for smelting, semi-fabrication and assembly processes to be distributed around the world as illustrated by the examples of tantalite and cassiterite in the figure 2.14.

Figure 2.14: Tin and tantalum in the value chain of Fairphone 2



Source: Fairphone (n.d.), A mass balance model for conflict-free tin and tantalum²⁹

Resource-rich countries have placed much emphasis on moving into downstream segments of the value chain in order to capture more value added, create additional employment opportunities and diversify their economies. Downstream value addition prominently features as a key policy objective in the Africa Mining Vision (African Union, 2009). While some resource-rich countries have provided incentives for and co-financed the construction of refineries (for example Angola and Uganda), others have used taxes and restrictions on exports to encourage downstream processing. In Africa alone 21 countries apply export taxes on EI to incentivise local processing (Ramdoo and Bilal, 2014). Indonesia has gone a step further and put in place an export ban on minerals below certain comparatively high concentration rates. To reach these levels of concentration, large-scale investments in smelters are necessary.

It is noteworthy that these government interventions mainly target smelting activities in the mining sector and refining activities in the oil sector. These industries are capital

intensive, require good infrastructure access and are highly competitive at the global level, given that there is not much room for product differentiation. While potentially having a significant impact on the gross domestic product of a country and supporting an expansion into activities further downstream, such as petrochemical or semi-fabrication industries, these industries are difficult to set up in developing countries with poor or inadequate infrastructure and are unlikely to be large employment providers on their own.³⁰

2.3.1 Literature review and case studies

The literature sheds some light on the determinants of downstream linkages and gives a nuanced view on several of them. This section reviews the impact of the proximity to resources, the government's negotiating position, the use of export restriction instruments and the resort to special incentives for the development of downstream linkages.

29 <https://www.fairphone.com/2015/08/20/supporting-fairer-mineral-initiatives-with-the-fairphone-2/> (accessed October 2015)

30 Timor-Leste is a good example for this, as a proposed LNG plant would double Timor-Leste's GDP but account for less than 1% of official employment numbers (Maennling, 2012).

Proximity to resources not a major determinant of comparative advantage

Proximity to the raw material and lower transportation costs of processed materials are arguments put forward as to why, from an economic viewpoint, there may be a comparative advantage to move downstream locally. In theory, this is particularly true for commodities that are bulky and heavy to transport prior to processing. However, on an aggregate level, empirical analyses of the comparative advantage resulting from proximity to the source have not substantiated this argument. Using trade data, Hausmann et al. (2008) find that raw commodities play a small role in determining comparative advantages, even for high volume products that are associated with higher transport costs. These findings persist for both developing and developed countries.

The iron-ore/steel sector is a good example that supports these results. **Australia** is one of the world's largest iron-ore producers, but a net importer of steel. Even though Western Australia signed downstream processing agreements with Rio Tinto and BHP Billiton in the mid-1990s which led to investments into the A\$2.5bn Boodarie hot briquetted iron plant and the A\$1bn Kwinana Hismelt pig iron venture, both operations were never economically viable and were ultimately shut down (Klinger, 2011; FitzGerald, 2004). **Japan**, on the other hand, has a long history in steel production and was the second largest producer of crude steel after China in 2014 but does not have access to the raw materials domestically (World Steel Association, 2014). One explanation put forward by Hirshman (1981) is that downstream processing requires technologically advanced production processes, which commodity-exporting countries are less familiar with. Access to cheap and reliable energy and other types of infrastructure are also factors that are more important to moving downstream than proximity to resources.

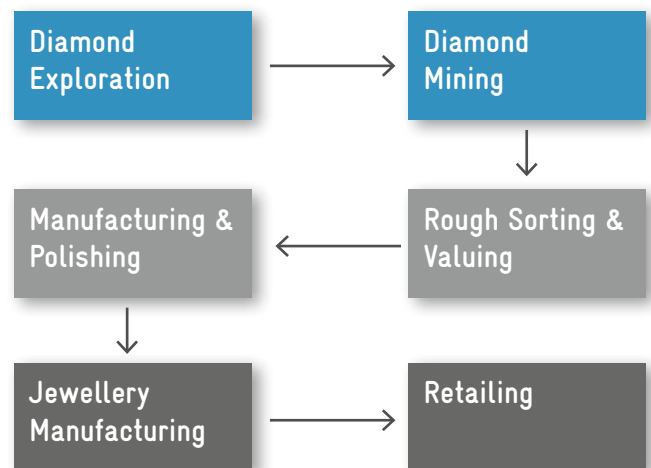
Whereas it might not be advantageous to move downstream from a comparative advantage perspective, it is a different question whether governments should use policy instruments (e.g. incentives such as taxes or regulations such as export bans on unprocessed goods) or a strong negotiation position to promote moving into downstream activities. This can be justified if there is a possibility to create a competitive advantage in the long run by protecting the industry in the short run, which is known as the infant industry argument. Benefits of such policy decisions may include increased GDP, foreign exchange earnings, government revenues, employment opportunities, and expanding into technologically more advanced sectors, all of which are associated with substantial spillover effects. Especially for countries that

do not possess many competitive advantages, downstream activities in the EI sector may be one of the few opportunities to diversify their economies and become less dependent on raw commodity exports. However, such policies come at a cost and require government commitment to support the implementation of these decisions.

Leveraging a government's negotiating power to move downstream

One country that has recently leveraged its extractive sector to move downstream is Botswana. The figure below shows the value chain of the diamond industry. For many years, the Government of Botswana has tried to move downstream from mining into the sorting, valuing and polishing sectors. India dominates the polishing sector due to a large pool of low cost specialized labour, with 14 out of every 15 diamonds being polished there. The major manufacturers of jewellery are India, China and other countries of the Far East, though the top-end pieces are produced in traditional manufacturing locations such as Italy and New York.

Figure 2.15: Diamond value chain



Source: Authors

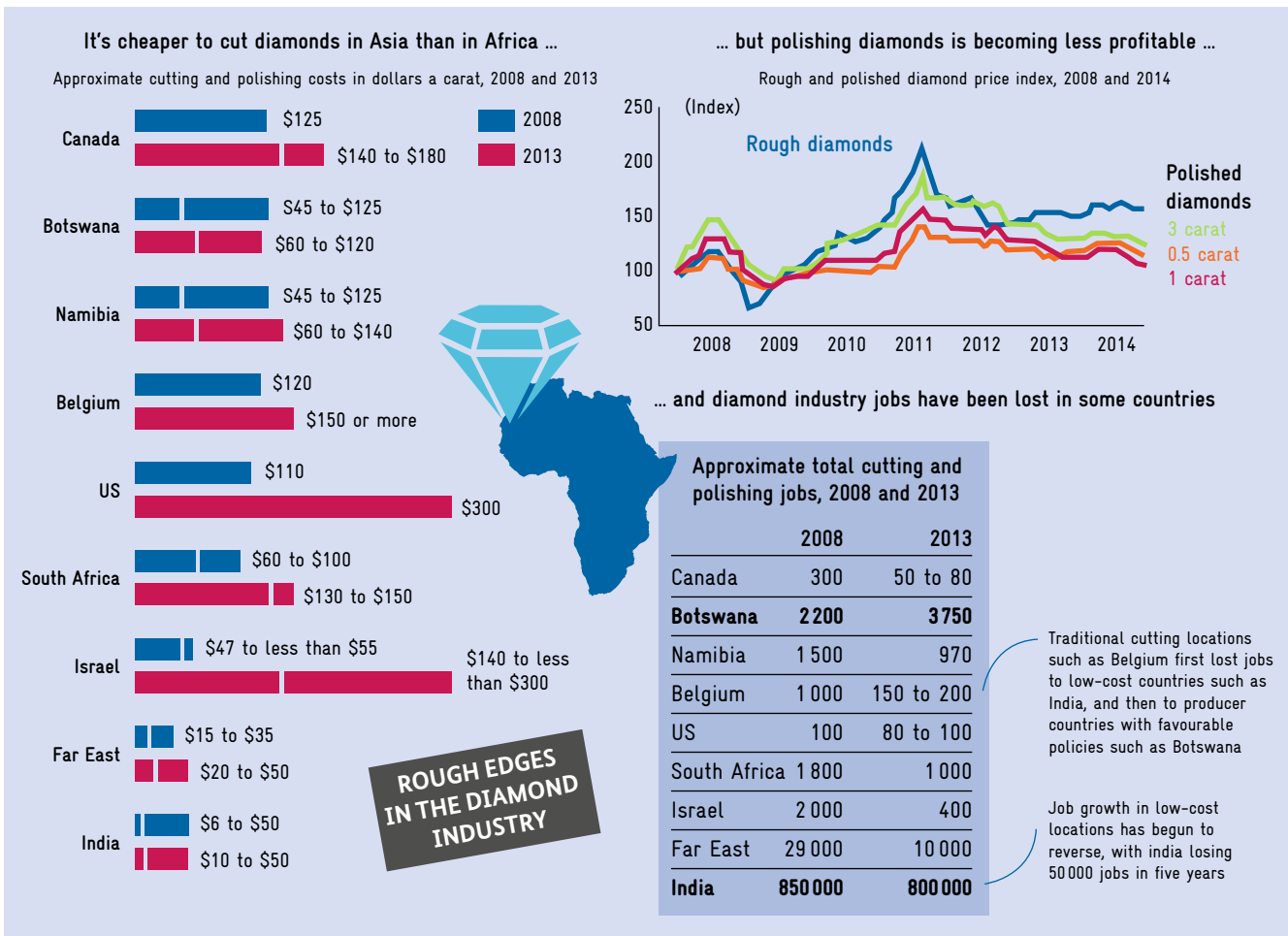
The box on the next page illustrates that diamond polishing and manufacturing in Botswana would not naturally occur in the country now if the government had not negotiated a fixed allocation of rough diamonds for domestic processing.

Box 2.10: Botswana moving downstream in the diamond value chain

Diamond deposits were first discovered in Botswana shortly after independence in 1966, with large-scale production starting in 1971. Shortly thereafter, diamond mining became the most important sector in Botswana's economy in terms of contribution to GDP (recently around 30%) and government revenue (recently around 60%) (Brook, 2012). In order to increase employment opportunities, the Government of Botswana first tried to develop the cutting and polishing industry in the 1980s. However, De Beers, the company that dominates the sales and marketing of diamonds both in Botswana and worldwide, argued that this was not profitable in Botswana.

In 2005, when De Beers wanted to renew its mining license for Debswana, a 50-50 joint venture between De Beers and the Government, the Government insisted on

the company's help with regard to developing a domestic cutting and polishing industry. Given that De Beers sources 60% of its diamonds from Botswana, it ultimately agreed to this demand. Consequently, a set amount of rough diamonds were allocated to the domestic cutting and polishing industry, wherein companies were required to hire locals and provide training in order to guarantee the allocation of diamonds. The target allocation would increase over time, with the agreement including fines for non-compliance with these targets. Moreover, the government would support the industry through fiscal incentives and infrastructure investments. De Beers also agreed to move its aggregation business – selecting and mixing the diamonds from DeBeers mines for its customers – from London to Gaborone, in the hope of creating considerable spillovers to other industries such as hospitality, finance and transportation, since diamond buyers would now have to go through Gaborone to buy De Beers' diamonds (Morris et al., 2011).



SOURCE: GRYNBERG (2015), BOTSWANA DIAMOND WORKERS BLEED, GRAPH BY JOHN MCCANN

In 2014, it was estimated that the cutting and polishing industry in Botswana employed 3,750 people with salaries above the manufacturing industry's minimum wage. However, it remains to be seen whether the sector will be competitive in the long term. In 2015, the country's oldest diamond cutting and polishing company shut down, causing the layoff of 350 workers, due to falling diamond prices and smaller margins in the polishing industry. Nonetheless, the more fundamental issue is that Botswana cannot compete with the low-cost and high-productivity producers in the Far East and, especially, India (Grynberg, 2015). The cost of cutting and polishing diamonds in India in terms of dollars per carat is three to five times lower than that in Botswana (see figure on previous side). This shows that the only reason why cutting and polishing happens in Botswana (and even more so in South Africa and Namibia) and not in India is government policy instead of the existence of a comparative advantage.

The government of Botswana is aware that unless investments in support infrastructure decrease production costs substantially, the diamond-polishing sector is unlikely to survive in the long term. This is especially true for

when the rough diamond reserves in Botswana will be exhausted, resulting in a decrease of Botswana's bargaining power, which is expected to be in 30-40 years. However, Botswana has clear comparative advantages in a few other sectors (tourism may be one of them) and a 30-40 year timeline may be sufficient to create a large and skilled labour pool in the polishing industry to make Botswana competitive. Even if the polishing sector collapses within the next 40 years, a well-educated labour force, is more likely to be able to adapt to structural change by developing horizontal linkages from a relatively sophisticated industry like diamond polishing than from one purely based on the extraction of the raw material, or as Hirschman nicely puts it- 'one thing leads to another' (Hirschman, 1968).

German Technical Cooperation has supported the Government's efforts to move downstream in the diamond value chain through the 'Capacity Development to achieve the Botswana Vision 2016' programme, which ran from 2008 – 2014 with a budget of EUR4.2 million. The project strongly focused on technical and vocational education and training, e.g. in jewellery design and manufacturing (GIZ, 2012).

The **Botswana** case study shows that the government has successfully leveraged its negotiating power to move downstream. The Government has understood that in order to become competitive, it needs to support its policy decision by investing its own resources (see recommendation G2). It remains to be seen whether the downstream sector in Botswana becomes sustainable in the long term (see recommendation D8). However, even if it does not prove successful, the skills acquired by those employed and trained in the sector are likely to be valuable in the future, even if applied in other industries.

Using export restriction policies to move downstream

Indonesia has imposed export restrictions and, more recently, a ban on the export of raw materials. Such policy instruments are likely going to decrease investment in the mining sector and result in the closure of marginally profitable mines that either cannot invest in capital-intensive processing facilities or where the operating costs associated with the processing facilities are too high. Nathan Associates assessment of Indonesia's export ban on raw materials is a case in point.

Box 2.11: Cost-benefit analysis of the economic impact of Indonesia's export ban

Indonesia is the biggest exporter of thermal coal, nickel ore and tin in the world and a powerhouse in copper and gold production. The country implemented a ban on the export of unprocessed mineral resources in January 2014, which requires companies to process the mineral up to a certain grade prior to exportation. The minerals affected by this policy include copper, nickel, tin, bauxite, iron, lead and zinc, which are highly relevant to Indonesia's mining sector. During the current phase, companies will have to pay high export taxes for unprocessed ores until the ban takes effect.

Nathan Associates (2013) prepared a welfare analysis of the potential impacts of such a ban and found that investments in processing facilities are often unprofitable. While the report finds that investments in nickel processing could be feasible when modelled in conjunction with a mining project, investments in aluminium smelting would require large energy subsidies. Copper smelting investments, on the other hand, would not be undertaken due to excess smelting capacity in world markets, which have substantially driven down the margins of the copper smelting industry. This would make it difficult to raise sufficient capital to finance these large-scale smelter investments. Under the medium investment scenario that foresees some nickel and aluminium smelters going ahead but the copper mines having to shut down, the report estimates that the export ban policy would result in a net welfare loss of \$5.2bn a year, with export earnings falling by \$4.9bn.

Although the government of Indonesia agrees with the report that the policy will lead to short term losses (the Minister of Finance, for example, stated that this policy would reduce government revenues by \$820 million in 2014), it believes that the policy will result in a net positive impact in the medium to long term. 25 companies have begun constructing processing facilities and, in 2013 alone, investments into smelting and refining reached \$6 billion. The Minister of Finance anticipates a positive net impact by 2017 (Bellefleur, 2014).

The **Indonesian** case study shows that the costs associated with processing facilities may outweigh the benefits. Therefore, cost-benefit analyses of the likely impacts of measures like export bans are necessary (see recommendations G2, D4). One of the key problems with such analyses is that it is difficult to quantify some of the long-term potential benefits, whereas it is relatively straightforward to estimate the short-term costs associated with the closure of marginally profitable mines.

Using incentives to move downstream

Countries that do not have a strong negotiating position to move downstream or cannot rely on prescriptive measures because they do not have a large market share in a particular commodity may only rely on incentives to try and move downstream. When considering whether to offer investment incentives, a similar cost-benefit assessment as set out further above is required. The Mozal aluminium project in **Mozambique**, while not directly linked to bauxite mining, provides a good example where the government provided significant investment incentives and signed a long-term low-cost electricity agreement with BHP Billiton in order to attract the large scale aluminium smelter. There have been concerns that the incentives were (and are) too costly and the expected benefits - a domestic supplier base and an aluminium cluster around the smelter - did not materialize as expected.

The Mozambique case study illustrates that the smelting sector, which is often a sector targeted by policy makers, is still a very capital- and energy-intensive industry and further downstream linkages take time to materialize (see recommendation D8). The case study further shows that incentives should be applied with care and should be linked to the profitability of projects rather than granted for the lifetime of projects. Special care needs to be taken when providing long-term energy incentives in order to attract downstream investments.

Box 2.12: Costs and benefits of the Mozal aluminium smelter in Mozambique

The \$1.3 billion Mozal aluminium smelter investment was awarded in 1997 to a consortium composed of BHP Billiton (47%), Mitsubishi (25%), the Industrial Development Corporation of South Africa (24%) and the Government of Mozambique (4%). The IFC provided financing for this project. In addition to exemptions from the value added tax, excise duties, customs duties, stamp tax, property tax and municipal tax on rental income, Mozal is also exempt from corporate income tax payments and instead pays a 1% turnover tax. It has been estimated that in 2006 alone, these incentives resulted in foregone public revenues equivalent to 11.9% of total government revenues (Arndt and Tarp, 2009). These incentives have been granted for a 50-year time period, with an option for renewal. It could be argued that these incentives are not a direct cost to Mozambique, because without these incentives the smelter would not have materialized. However, there is a strong case that the internal rate of return, based upon which investment decisions are made, would have been sufficiently high for Mozal even without such lengthy incentives (Justica Ambiental, 2012). In addition, Mozal also negotiated a beneficial electricity tariff until 2026 as part of the investment agreement.³¹ Access to reliable and low-cost electricity is key for the aluminium-smelting sector, given that it makes up ca.30% of total operating costs. In 2007 peak electricity demand in Mozambique was less than half of Mozal's peak demand. This illustrates the opportunity cost that this electricity agreement may entail for Mozambique, especially as residential and industrial demand for electricity increases and alternative investments are willing to pay for a higher electricity tariff allowing the power utility to achieve cost recovery.

The benefits associated with Mozal aluminium smelter investments include (a) an increase in GDP by 3.2%, (b) a significant positive impact on the balance of trade, (c) a positive impact on the balance of payments, (d) 1,100 direct employment opportunities, and (e) the financing of public infrastructure to support the project, which was repaid by the government in the form of amortised deductions from the turnover taxes. Investments comprised roads, bridges, sewage, harbour quays and water connections (Castel-Branco and Goldin, 2003).

The indirect employment benefits and knowledge spillovers from the Mozal aluminium smelter have been harder to quantify. The IFC has been involved in promoting the creation of upstream linkages through SME linkages programmes. In 1998/1999, prior to the start of Mozal's operation, the Center of Investment Promotion (CPI) conducted a survey to identify potential upstream linkages. It concluded that 90% of the 370 identified SMEs did not have the quality standards, technological capacity or experience to provide the services demanded by Mozal (Castel-Branco and Goldin, 2003). During the first construction phase, the linkages to the Mozambican economy were minimal, mainly because the contracts were bundled with components that Mozambican SMEs could not fulfil and because the procurement contracts were in English instead of Portuguese (Robins, 2009). During the second construction phase and subsequent operational phase, the programme identified specific contracts for local sourcing. Mozal increased its monthly spending from US\$5 million with 40 local firms in 2002 to US\$17 million with 250 firms in 2007 (IFC, 2007). Between 2006 and 2009, over 140 SMEs were trained in management and technical skills and 75 SMEs were actively enrolled in the programme.

However, there has been criticism that many of the SMEs, while registered in Mozambique, were importing most goods from South Africa and not manufacturing them in Mozambique itself. On average, about two-thirds of expenditure spent on "Mozambican" companies has gone into imports of raw materials and intermediate goods, spare parts, equipment, energy, and fuel from South Africa. Therefore, the expenditure has generated limited value-added in the local economy (Castel-Branco and Goldin, 2003). Knowledge spillovers are also thought to have been minimal due to the contracted companies servicing a small market niche, which is completely dependent on Mozal (Krause and Kafuman, 2011).

The expected downstream cluster that would make use of Mozal's aluminium domestically has yet to materialize. Only in 2015 – 15 years after operations at Mozal started – has Midal Cables invested in a semi-fabrication plant, which will process 10% of Mozal's aluminium ingots. Continuing its support to create linkages to the Mozal aluminium smelter, the IFC has provided financing and has acquired an equity share in the project. The company will employ 110 workers directly and receives the fiscal benefits associated with setting up in the export processing zone.

³¹ A portion of the electricity comes from Mozambique, which does not have a power grid connecting the north of the country (the main power source) to its south (the main power consumption center) and therefore exports the power from Cahora Bassa dam to South Africa and re-imports it along the Maputo corridor.

2.3.2 Lessons learned from the literature and case studies

As illustrated by the various case studies, the downstream activities of extractive sectors are very commodity specific, while the opportunities of moving downstream are very country specific. The costs and benefits of moving downstream therefore vary tremendously. The policy tools available to governments in order to move downstream include prescriptive policies like export taxes or restrictions, as in the case of Indonesia, the negotiation or re-negotiation of existing contracts, as in the case of Botswana, or incentives, as in the case of Mozambique. All these tools, however, require a detailed cost-benefit analysis. Even in the case of Botswana's diamond cutting and polishing industry, the government will incur costs from moving downstream, as it has to invest in support infrastructure and has given up on tax revenues in return for the allocation of diamonds to domestic downstream industries. These costs should not be underestimated; while it is difficult to quantify all potential benefits and costs (even in retrospect as shown by the Mozambican case), such

technical assessments are still required in order to make the best possible policy decision.

The downstream sector should be treated the same as other sectors in the economy when deciding whether to support it through an industrial policy, given that the closeness to natural resource does not seem to be a major contributor to determining the comparative advantage of the country (see recommendations G2, D4). The opportunities of moving further downstream from the smelting and refining processes should play a key role when deciding to whether these intermediate value addition industries should feature in the industrial policy. While the smelting and refining facilities are capital-intensive investments that do not provide large employment opportunities, clusters in the semi-manufacturing and manufacturing or assembly industries are more labour intensive. Most of the benefits from moving downstream occur in these sectors. If there is little potential of moving further down the value chain, it is questionable whether it is worth trying to attract smelting or refining industries.

Table 2.2: Summary of key characteristics of downstream linkages

BENEFITS	<ul style="list-style-type: none"> - Potential of positive impact on GDP, the balance of trade and export earnings. - Price swings of downstream products tend to be less volatile than of unprocessed commodities. - Skill development in new areas and potential to create further downstream industries.
DRAWBACKS	<ul style="list-style-type: none"> - Takes time to develop. - Capital and energy intensive industries. - Often expensive for governments to support.
COMMODITY SUITABILITY	<ul style="list-style-type: none"> - Oil processing not geographically bound, but LNG processing is. - Only few minerals are geographically bound (beyond crushing and grinding) as a result of falling bulk commodity shipping costs.
REQUIRED INFRASTRUCTURE AND SKILL LEVEL	<ul style="list-style-type: none"> - High infrastructure and power requirements.
EMPLOYMENT	First step beneficiation (smelters and refineries) does not create many employment opportunities. Need to move further downstream in order to have a bigger impact on employment.
GENDER	Capital intensive industries do not tend to employ many women.
MAIN POLICY MEASURES	Cost-benefit analyses required, Policy measures adapted to context (negotiation, export restrictions, incentives) Required support mechanisms such as industrial parks
RECOMMENDATIONS (CHAPTER 4)	<ul style="list-style-type: none"> - EI Companies: 2,5 - Governments: 1,2,4,8,9,10 - Development cooperation: 1,2,3,4,5,8,10

SWOT Analysis for downstream linkages:

Strengths (internal):

1. Widespread host government interest to adding value to minerals, oil and gas locally through downstream processing.
2. In a few limited cases, minerals and gas deposits are geographically bound, creating a natural incentive for downstream beneficiation.

Weaknesses (internal):

3. Unlike other linkages, moving downstream is often not in the self-interest of EI companies.
4. Downstream activities tend to require particular skills, are highly dependent on good infrastructure access and are often energy intensive. Countries that cannot offer these prerequisites will struggle to attract downstream industries.

Opportunities (external):

1. In recent years, mining companies from the global South have increasingly played a role in FDI. Chinese companies in particular have invested in downstream projects in order to gain access to resources.³²

Threats (external):

1. The potential for downstream linkages is related to a globally very competitive, low margin industry. In a world with excess smelting and refining capacity, it would require governments to offer excessive incentives in order to setup new smelters and refineries. It does not make economic sense for each country that has iron ore reserves to have a steel mill or every country that has bauxite to have an aluminium smelter.
3. Continuously falling transport costs due to increases in the size of bulk carriers further decrease the benefit associated with beneficiation close to the source of extraction.
4. Prescriptive export restrictions may be against WTO and investment treaty rules (see chapter 3).

Figure 2.16: SWOT Analysis for downstream linkages



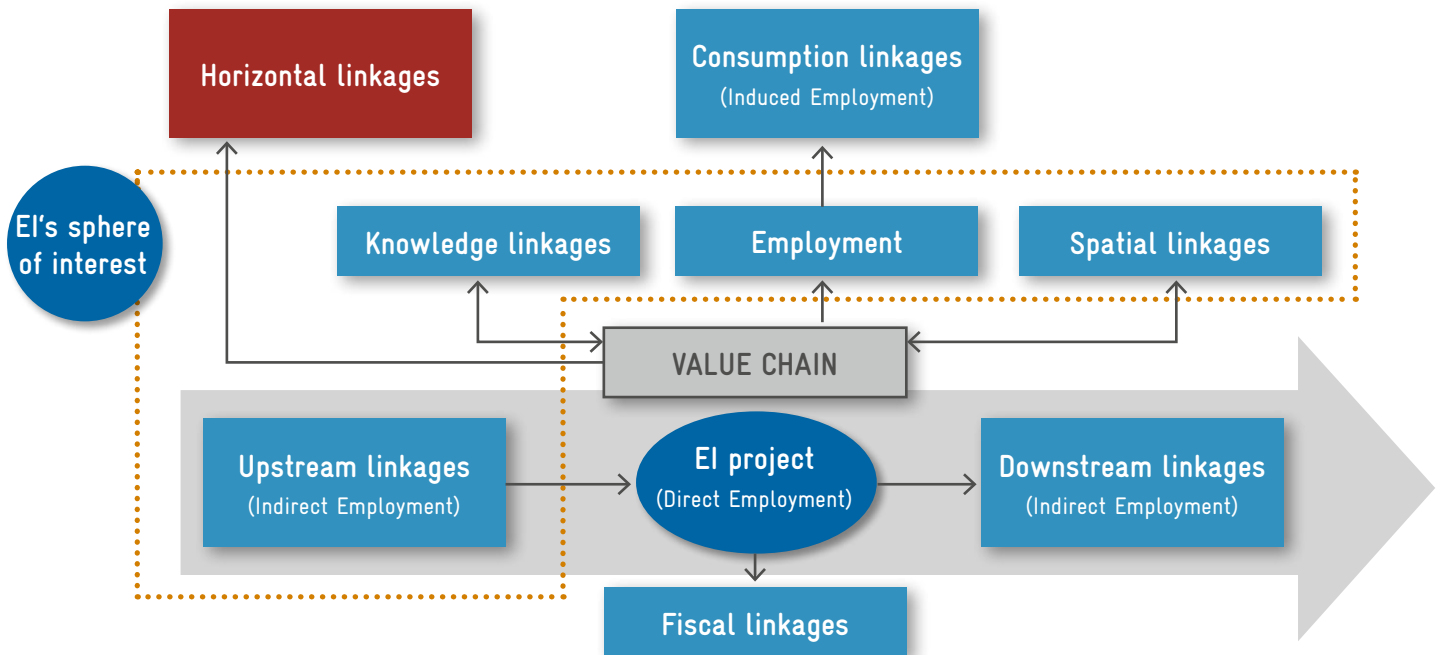
Source: Authors

2.4 Production Linkages: Horizontal / Lateral Linkages

Horizontal (lateral) linkages: while upstream and downstream linkages constitute “vertical links” created along the value chain, **horizontal (lateral) linkages** relate to the development of new industries using the capabilities of the EI-related supply chain. By enabling the emergence of new economic sectors, these linkages play a key role in the diversification of the economy and lowering the dependence on the EI sector. While the upstream and downstream sectors are likely to be adversely affected by price downturns or the closure of projects, horizontal industries will not be impacted.

³² Examples for this include refineries in Angola, Nigeria and South Sudan. In Afghanistan, the Chinese consortium won the bid for the Aynak copper concession, partly by including a proposal to build a copper concentrator, which not all bidders included.

Figure 2.17: Horizontal linkages



Source: Authors

The key concept at the core of horizontal linkages is the adaptability of capabilities. As Kaplinsky (2011) put it: *“the probability that a country will develop the capability to be good at producing one good is related to its installed capability in the production of other similar, or nearby goods for which the currently existing productive capabilities can be easily adapted”*. While horizontal and knowledge transfer linkages are related concepts, this report differentiates between the two. Herein, the key difference is that whereas knowledge and technology transfers enable actors to improve their capabilities within the EI value chain, horizontal linkages enable them to adapt those skills to *other sectors*. This may be another sub-sector within EIs (for instance from coal mining to tar sands as in **South Africa**) or another sector away from the EI altogether (from gold mining to construction, agriculture, and general manufacturing, as in **South Africa**, or from forestry to electronics, as in **Finland**). Focusing on horizontal linkages is a particularly attractive policy for countries that have already established upstream linkages and developed good capabilities in their supply base (given that horizontal linkages are most likely to occur from upstream activities).

2.4.1 Literature review and case studies

Kaplinsky (2011) defines horizontal linkages as capabilities developed for the EI sector and used by other sectors, thereby enabling the development of new industries; those capabilities are generally relatively high skilled and/or technologically oriented. The literature is less expansive on horizontal linkages than on Hirschman’s two other pillars of the production linkages and therefore there are only few case studies. When exploring eight resource-rich countries in Sub-Saharan Africa, Morris et al. (2012) observed conclusive evidence for the creation of horizontal linkages only in **South Africa** (see box 2.13); in two other countries, **Ghana and Zambia**, the existence of such linkages could be assumed but no supporting evidence was found. While providing macroeconomic evidence for horizontal linkage creation is difficult, a number of papers provide anecdotal evidence of how the EI sector may have created horizontal linkages. Teka (2011), for example, finds that in Angola the manufacturing and assembly of oil rig control lines between the sub-sea and the surface require basic metal working capabilities, which could be adapted to spur development in the construction

and other manufacturing sectors. In Nigeria, the oil sector has outsourced information technology (IT) services; Oyejide and Adewuyi (2011) report that those IT skills are being applied to other sectors in the economy. More generally, Perkins and Robins (2011) claim that engineering skills developed during the construction phase of EI projects can be leveraged for other infrastructure-intensive industries. These experiences suggest that certain skills are particularly conducive for creating horizontal linkages. In **Madagascar**, GIZ's linkage creation programme determined that welding was particularly suitable to develop the skills in unrelated sectors as well.³³

Kaplan (2011) and Morris et al. (2012) argue that because every mining or energy resource is location-specific, the creation of horizontal linkages out of upstream linkages should be possible. The specificity of the resource leads to the development of specialized local skills and knowledge aimed at the EI sector. Those special capabilities can then serve specific niches in the market, both domestically and abroad. South Africa is a case in point.

.....

Box 2.13: South Africa and horizontal linkages

In South Africa, the coal deposits suffer from impurities, which require specific coal washing capabilities. "Arising from the development of capabilities by supplier firms to meet this challenge, horizontal linkages developed enabling the supplier firms to penetrate new and different markets, for example washing spirals for utilization in the Canadian tar sands" (Morris et al., 2012).

South Africa has also developed special expertise in deep gold and platinum mining. When mining activity declined at the end of the apartheid era in 1994, South Africa's highly specialized equipment manufacturers diversified by either expanding abroad or by modifying and adapting their generic technologies for use in other industries such as the construction, agriculture, and general manufacturing sectors (Walker, 2005).

.....

More recently, horizontal linkages to South Africa's mining sector weakened. Kaplan (2011) attributes this to 1) a growing knowledge and information gap between the mining-related companies and the non-mining sectors and 2) a market failure problem whereby first mover companies take the risks of venturing into non-mining sectors while much of the success falls to follower companies.

The case of **South Africa** shows that governments should address market failures associated with first mover problems by offering technologically more advanced suppliers incentives to branch out of the mining sector into new markets and products. This could be achieved through a fund financing training, market research and support infrastructure, all of which encourage the sharing of technological competencies. Such support could be given on a competitive and on a matching grant basis (see recommendations G5, D7).

While not linked to mining or oil & gas projects, the case of Finland shows how the country used its expertise in forest-based industries to move into engineering and later into ICT and electronics.

The **Finnish** case study highlights the key role that the Government played in the various phases of the country's development, placing high importance on tertiary education, knowledge, R&D, and forward-looking industrial policy³⁴ (see recommendations G2, G4, G6, D4, D7).

33 In Madagascar, GIZ worked with the Chamber of Mines, which was made up of 27 members including mining companies and suppliers, in order to develop a training programme that would provide skills not only applicable to the mining sector but also to other sectors of the economy relevant in the present and future (Interview with GIZ South Africa, August 2015).

34 Already in the 1960s, the government first set up the "Advanced Data Processing initiative" to review how the public sector was processing information and then the Advance Data Processing Board under the Ministry of Finance to analyze at the consequences of automation technologies for employment. In addition, in 1979 the Council of State appointed the Technology Council to explore this issue. In 1992, the parliament created the Committee for the Future, which became permanent in 2000. Recently, the committee refocused its analysis on globalization and competitiveness (Dahlman et al. 2006).

Box 2.14: Finland's leadership in electronics arose from its forestry sector

Finland went through three phases of development (Dahlman et al., 2006). The first two phases created a knowledge base for the forestry sector based on knowledge transfer from foreign technologies and the build-up of its absorptive capacity. During the third phase, this knowledge base was used to form an electronic sector serving first the forestry sector through upstream linkages and then other sectors and markets through horizontal linkages.

Phase 1: The resource-driven stage of the economy started in the mid-1800s and lasted until the 1930s. During this stage, Finland relied on its abundant timber resources, some minerals and hydropower. It produced very few equipment goods and the economy relied on technological imports. The economy grew due to the export of timber and wood products. The growing export revenues were reinvested into infrastructure, financial systems and educational institutions. Among the latter, the Academy of Finland was created in 1918 in order to promote high-level scientific research. It benefited from 15% of the Government's research funding. In 1943, the Technical Research Center of Finland was established as an applied research organization to develop new applied technological solutions and promote knowledge and technology transfers by participating in national and international research programmes and collaboration networks.

Phase 2: The investment-driven stage lasted from the 1950s to the late 1980s when national companies started to invest in modern and efficient production technologies

by adopting foreign technologies and further developing them. Expertise was developed in the fields of engineering, energy technology and papermaking machinery. A strong national consensus emerged in favour of investment over consumption. Capital was channelled towards particular industries, which also benefited from tax incentives. During this period, the Research Innovation Council (OKM) was established, which was chaired by the Prime Minister and mandated to advise the government on questions relating to science and technology. In 1983, the National Technology Agency was created under the Ministry of Trade and Industry to "formulate the Finnish innovation and technology policy". It provided funds in the form of grants and loans to incentivise R&D in private companies, institutes and universities.³⁵

Phase 3: The knowledge-driven stage started in the late 1980s with the emergence of a strong electronics sector, which was originally developed in the 1960s to serve the traditional forest industry by providing process control, factory automation, and information technologies. During the knowledge-driven stage, the economy also opened up, supported by policies shifting from traditional market interventions³⁶ towards the creation of competitive capabilities and the improvement of Finland's business environment. "A national innovation system in the context of industrial clusters", was prioritized, as highlighted by the *National Industrial Strategy White Paper (1993)*. A component of this strategy was to promote "networks among companies; and among companies, universities, and research institutes". Additionally, in 1997, 15 Employment and Economic Development Centers, publicly owned institutions providing various business-related services and financing to SMEs, were created. The emergence of the (former) world's largest telecommunications company, Nokia, exemplifies the success of these measures

2.4.2 Lessons learned from the literature and case studies

The case studies from **South Africa** and **Finland** suggest that horizontal linkages can be created if the skills and knowledge used to address specific needs of the domestic EI sector are leveraged and adapted to serve other markets at home or abroad. In order to incentivise this positive externality and diminish the first mover market failure, broad government support is needed. This support can take the form of encouraging the formation of clusters with industries that have

synergies with the EI sector, related industries, and technological institutes (as recommended by the **Finnish** National Industrial Strategy White Paper (1993)); the creation of high skills training institutes supporting the transfer of capabilities from one sector to the other (such as the Finnish TEKES);

³⁵ In 20 years, TEKES' budget for R&D activities increased eightfold and constitutes now about 28% of the government's total R&D budget (Dahlman et al. 2006).

³⁶ The Finnish government used aggressive exchange-rate policies to boost exports in the 1960s.

the creation of a “new product” development fund that supports horizontal linkages (as recommended by Kaplan in South Africa); and the creation of a conducive environment for public-private partnerships involving economic research organizations, industry federations and companies

to raise initiatives aiming at the transfer of capabilities from one sector the other (see recommendations E7, E8, G4, G5). Development partners have a major coordination role to play, while financial cooperation could help financing technological institutes (see recommendations D1, D7).

Table 2.3: Summary of key characteristics of horizontal linkages

BENEFITS	- Diversification with less reliance on extractive industries & associated price swings
DRAWBACKS	- Requires an existing supply base with technical expertise - Necessitates new strategies that are not yet designed in developing countries
COMMODITY SUITABILITY	- Bulky commodities and LNG projects, which require significant construction of infrastructures, will generate civil engineering skills that may be transferable to other sectors.
REQUIRED INFRASTRUCTURE AND SKILL LEVEL	- Only once the skills have been developed through upstream linkages, horizontal linkages are likely to occur.
EMPLOYMENT	- Dependent on the sector to which horizontal linkages are created (Capital vs. labour intensive)
GENDER	- Dependent on the sector to which horizontal linkages are created (high vs. low female participation rate)
MAIN POLICY MEASURES	- <u>Develop upstream linkages first (if not already in place)</u> - <u>Build transferable skills</u> - <u>Promote industrial clusters that may benefit from technologies applied in the EI sector</u> - <u>Set up funding mechanisms that encourages first mover companies to venture into new sectors</u>
RECOMMENDATIONS (CHAPTER 4)	- EI Companies: 7,8 - Governments: 1,2,4,5 - Development cooperation: 1,2,4,7,8,1

SWOT Analysis for horizontal linkages:

Strengths (internal):

1. The location and geology of ore and hydrocarbon deposits often require specialized tools and skills to be extracted. These can become a comparative advantage of the country and provide the opportunity to be adapted in order to serve niche markets at home or abroad.
2. The EI sector requires the development of engineering skills and metallurgy capabilities, which are sought after by other sectors.

Weaknesses (internal):

1. Governments lack an awareness of the potential for horizontal linkages, which translates into a lack of policies targeting those linkages and of institutions facilitating them.

Opportunities (external):

2. Economic diversification looms large on resource-rich countries’ agenda, thus more attention might be placed on the promotion of horizontal linkages.

Threats (external):

1. Development partners have not paid much attention to horizontal linkages so far as compared to the other types of production linkages.

Figure 2.18: SWOT Analysis for horizontal linkages

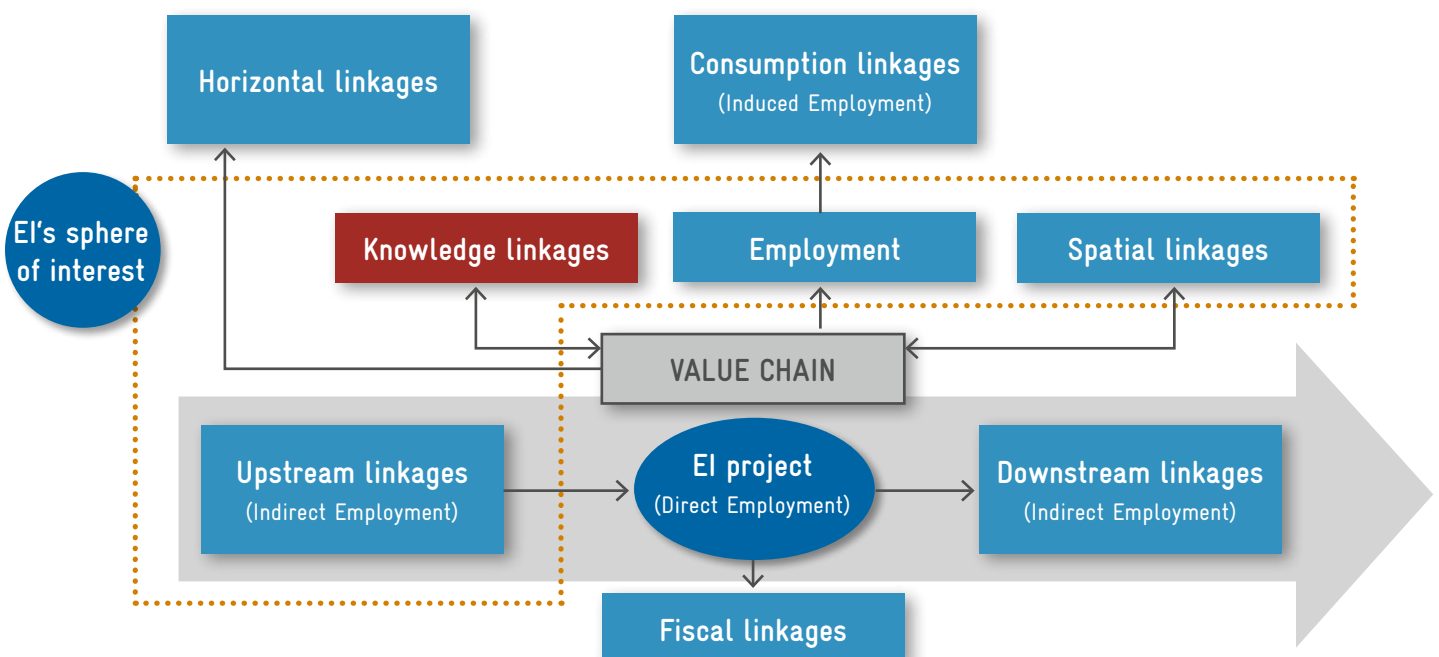


Source: Authors

2.5 Side-stream Linkages: Knowledge and Technology Linkages

Knowledge or technological linkages are related to transfers in know-how and skills. One of the key reasons to attract FDI in the EI sector in the first place is the need for knowledge and sophisticated technologies to extract the resources, which are often not available domestically. There is a strong incentive for host countries to absorb knowledge, skills and technology from the foreign investor. An optimal policy would convert the depleting natural resources into productive human and capital assets over time, which can be the basis for expanding the production possibility frontier. One of the objectives of state owned companies – more prominent in the oil and gas sector than in the mineral sector – is to acquire foreign expertise, which will allow the country to have greater leverage and control over future projects in the EI sector.

Figure 2.19 Knowledge and technology linkages



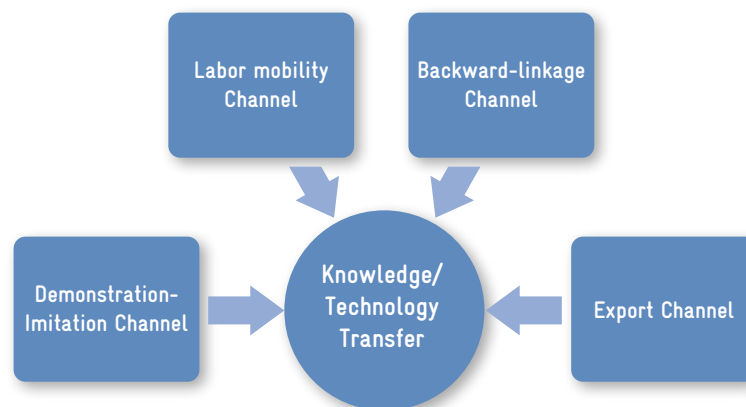
Source: Authors

Apart from learning about the extraction phase, there are also opportunities for knowledge and technology transfer throughout the value chain. The extraction process is likely to require inputs (upstream) that require knowledge and technology not available domestically. Similarly, there could be knowledge and technology transfer opportunities at the processing stage (downstream). Finally, other sectors of the economy could benefit from knowledge and technology spillovers from the EI value chain (horizontal).

The channels through which knowledge and technology can be transferred are illustrated in the figure below and can be categorized as follows: (1) The *demonstration-imitation*

channel, by which knowledge and technology is adapted from EI companies (Wang and Blomström 1992; Blomström and Kokko 1998; Sönmez 2013); (2) *the labour mobility channel*, by which employees trained by EI companies move into the domestic economy and apply their acquired knowledge and expertise (Fosfuri et al., 2001); (3) *the upstream-linkage channel*, by which the multinational corporation transfers knowledge and technology to domestic suppliers in order to meet their required standards (Bwalya, 2006; Javorcik, 2004; Kugler, 2006); and (4) *the export channel*, by which EI companies may enable local companies to access international markets (Aitken et al., 1997; Clerides et al., 1998; Greenaway et al., 2004).

Figure 2.20: Channels through which knowledge and technology can be transferred



Source: Authors

2.5.1 Literature review and case studies

It is difficult to measure the extent to which domestic economies benefit from knowledge and technology spillovers from FDI and the literature is inconclusive in this regard. Studies find positive, neutral or even negative impacts of FDI on knowledge and technology spillovers³⁷. However, the literature shows that the pre-existing level of know-how in the economy (also referred to as the absorptive capacity) is a key determinant of the level of spillovers (Ghebrihiwet, 2016). If the technological or knowledge gap is too great between the FDI and the host country, the opportunities will be few. To maximize the potential for knowledge and technological

spillovers, the FDI know-how should be slightly above that of the host economy (see for example Findlay, 1978; Wang and Blomström, 1992; Kokko, 1994; Lapan and Bardhan, 1973; Kinoshita, 2001; Crespo and Fontoura, 2007).

One policy tool available to governments to influence private sector R&D, knowledge and technology transfers is the level of protection of intellectual property rights (IPRs). There is much debate around how stringent these should be in order to foster R&D and maximize knowledge spillovers. Proponents of strong IPRs suggest these are the basis to assure companies that their research investments provide adequate returns (Maskus, 2004; Foray, 2009), and that they provide ownership advantages to companies in developed countries

37 For an overview of empirical studies, see Knell and Rojec (2011).

that are less inclined to invest abroad if their technologies are not protected (Hassan et. al, 2010). Opponents argue that strong IPRs increase market power for investors, who will seek to sell the technology at a higher price than the social optimum (Hassan et. al, 2010) and that weak IPRs can encourage ‘non-market based’³⁸ involuntary international technology transfers through reverse engineering and imitation (Foray, 2009).

Empirical studies have mainly focused on market-based technology transfers. Smith (2001) finds that strong IPRs give incentives to firms in developed countries to license their technologies to other companies in developing countries. In weaker IPR jurisdictions, companies prefer to keep technologies within their foreign affiliates, given that they have less control over the technology transfer process. Using U.S. FDI data, Nicholson (2007) finds that capital-intensive industries are more likely to keep control over their technologies in countries with weaker IPRs. The likelihood of companies with high R&D expenses contracting unaffiliated companies increases with more stringent IPRs. Leger (2007), on the other hand, finds that IPRs and past R&D investments have a positive and significant impact on innovation in developed countries, but not in developing countries. This is in line with several studies that have found a non-linear U-shaped relationship between IPRs and economic development (Maskus, 2000; Braga et al, 2000; Chen and Puttitanun 2005) suggesting that less developed countries are harmed by stringent IPRs up to a certain point in their development where the relationship changes. The benefits from less stringent IPRs are likely to result from the non-market-based technology transfer channel via involuntary dissemination of technologies that are copied and reverse engineered. Foray (2009) provides several historical case studies that show how developed countries have used weak IPRs to boost the development of their own industries. The empirical literature suggests that proper attention must be given to the level of existing IPRs in the country and the economic circumstances; it also argues that blanket rules may actually be harmful if they are set too high. To address the specificities of particular industries, the IPRs might also have to be adapted by sector. While much research has been done on industries such as the pharmaceutical sector, little research has been done on EI. Hence, lessons learned from this linkage type have to be deducted from anecdotal evidence and case studies.

Demonstration–Imitation Channel

Brazil, Chile and Norway have been relatively successful at benefiting from the imitation channel through their respective state-owned companies. Petrobras imitated the Early Production Systems³⁹ approach from the North Sea to develop Brazil’s deep and ultra-deep offshore oil deposits (Dwyer et al., 2013), Codelco enhanced and ultimately exported copper smelting technologies to Zambia, which were first introduced in Chile by Japanese and Canadian investors in the 1970s (Gana, 1992), and Norway’s Statoil acquired management practices from Mobil as explained below.

Box 2.15: Statoil acquires management practices from Mobil

After the discovery of oil in the late 1960s, Norway created the state-owned enterprise Statoil in 1972 with the primary purpose of participating 50% in all allocated production licenses. Two years later Mobil discovered Statfjord, one of the largest oil fields in the North Sea. Statoil partnered with Mobil, which was the operator of the field, and followed its management practices until taking over its operations in 1986. Apart from replicating the company structure and recruiting foreign nationals for top management positions that would later be substituted by Norwegians, the Government required foreign companies to closely collaborate with local universities and required that at least 50% of research done by IOCs on developing oil from the Norwegian continental shelf be done domestically. This led to the creation of research centres such as Sintef, Christian Mechelsens Research, and Rogaland Research, which specialized on applied geology, well drilling technology and enhanced oil recovery (Gulbrandsen and Nerdrum, 2007). Licensing rounds were used to reward companies that offered R&D partnerships and preferential treatment was given to those that would source from domestic companies. This policy contributed to Norway today exporting its offshore service expertise to the rest of the world.

The case study from **Norway** highlights the role that state-owned companies (see recommendation G8) and R&D requirements with domestic universities (see recommendations E8, G5,) may play to foster knowledge and technology linkages.

³⁹ Early Production Systems are used to reduce reservoir risks. They involve the production of oil through a temporary processing system and an export of the processed crude to a storage vessel for subsequent transport to market.

³⁸ Market based channels being trade, FDI and licensing

Labour mobility channel

With its long mining history, **South Africa** is thought to have benefitted from the labour mobility channel. Many of the senior and skilled workers in the mining supplier sector – that does not only serve the mining industry in South Africa but also exports its services to neighbouring countries – were previously directly employed by mine sites where they acquired their skills and expertise (Walker, 2005). However, by hiring the most qualified and knowledgeable people in the country, the EI sector can also create a ‘brain drain’ in other sectors, thereby creating negative knowledge spillovers in the economy (Sinani and Meyer, 2004).

Upstream-linkage channel

When sourcing locally, EI companies have an incentive to support the supplier in reducing the cost and improving the quality of the procured goods and services. This may enhance the competitiveness of both the multinational and the local suppliers. The Anglo Zimele programme by Anglo American in **South Africa** provides a good illustration of how transfer of knowledge from the mining company to the suppliers can create benefits for both and create technological spillovers.

Box 2.16: Anglo Zimele Programme in South Africa

Anglo Zimele is the enterprise development and empowerment initiative of Anglo American in South Africa, which started in 1989 with the aim to develop small businesses that were owned by black entrepreneurs. The Supply Chain Development component supports the creation of SME that will provide goods and/or services to the mine site. It acts as an incubator helping to create the necessary expertise and financial start-up capital before exiting the partnership.

If the initial investment proposal is accepted, Anglo Zimele enters into an equity partnership (between 10–49%) and provides additional loans for the implementation of the project. A business development

officer is appointed as non-executive director to monitor the development of the SME and to provide support in management, marketing, operational and financial decisions. Training courses are also offered in areas such as financial management, computer literacy, business management, production management and accounting. The exit phase entails the sale of Anglo Zimele’s shares to the entrepreneurs based on commercial terms and conditions as set out in the shareholders’ agreement. This phase usually commences 3 to 5 years after the initial investment and should be completed within a year after commencement (Anglo American and The IFC, 2008). A survey from 2005 showed that 72% of the companies Anglo American had invested in, survived 8 years or longer (Wise and Shtylla, 2007).

The **South Africa** case study highlights how mining companies can contribute to the knowledge and technology spillovers through the upstream linkages channel. Apart from providing the suppliers with start-up capital, the programme also foresees support to the management of the company during the initial phases (see recommendations E7, E10)

Export channel

The presence of foreign EI companies may also enhance the export capacity of local companies. Apart from providing valuable information about export markets and learning about the requirements necessary in order to access those markets, EI companies can act as channels to help local companies accessing these markets (Greenaway et al., 2004). One third of domestic suppliers in **Ghana** and 42% of domestic suppliers in **Chile** that were servicing foreign mining companies were also found to be exporting their services to other jurisdictions (Farole and Winkler, 2014). The World Class Suppliers Programme (see box 2.17) is an illustration of the export channel.

Box 2.17: World Class Suppliers Programme in Chile

The World Class Suppliers programme, launched by BHP Billiton in 2009 and joined by Codelco in 2011, aims to provide the right collaborative environment for suppliers to innovate. The collaboration is based on the supplier proposing new technological solutions to problems faced by the mining company, financing the R&D, and acquiring the intellectual property if the research results in a successful product. The mining company provides technical, managerial and financial support; offers the mining operations as testing grounds for the new technologies; and offers assistance in accessing international markets. By 2013, BHP Billiton had operated 43 innovation projects with 36 suppliers participating. These suppliers with around 5,000 employees had combined sales of \$400 million. BHP Billiton has invested around \$50 million in the programme, which is less than half of the estimated savings resulting from the innovations of around \$121 million.

In 2012, suppliers participating in this programme were more likely to export to other markets than those who supplied to the mining sector that did not have the same support mechanisms. Of the suppliers who did not participate, 34% of them exported compared with 51% that were part of the programme (Innovum, 2014). Prodinsa, for example, which developed steel cables for BHP Billiton that resulted in the shelf life of the cables being extended by 40%, started exporting these to BHP Billiton's Antamina mine in Peru, thereby accessing a new market.

Chile's case study exemplifies how changes in procurement strategies can lead to innovative solutions by suppliers and how the EI sector may support suppliers to access foreign markets. Furthermore, it shows the benefits of collaboration between EI companies in order to achieve economies of scale (see recommendations E3, E9, G8, D6)

2.5.2 Lessons learned from the literature and case studies

The level of expertise available in a country is a key determinant of which technologies and knowledge can be transferred: if the gap between the company and the foreign investor is too large, the domestic companies will not be able to replicate the technologies required by the EI company. From a policy perspective, the first step should therefore be to identify the current technological boundaries of the domestic labour force and companies, and to perform a needs assessment of the skill requirements of the EI company. Support programmes will have to be tailored to push the production possibility frontier outwards. The IPRs will also need to be tailored to the development stage of the country and the absorptive capacity of the industrial base.

The case studies have shown several ways in which governments can promote knowledge and technology transfers, including partnerships between state owned companies and the EI companies (as seen in **Norway** and **Chile**); joint ventures between domestic suppliers and the EI companies (as seen in **South Africa**); and joint R&D centres and programmes (as seen in **Norway** and **Chile**). Furthermore, governments need to design academic courses that elevate the technological level of the workforce according to the labour requirements within the EI sector and adapt the intellectual property rights to the economic circumstances.

Table 2.4: Summary of key characteristics of knowledge and technology linkages

BENEFITS	<ul style="list-style-type: none"> - Knowledge and technical expertise are the basis for economic development - Labour force with technical expertise more adaptable to structural changes
DRAWBACKS	<ul style="list-style-type: none"> - EI companies will try to prevent knowledge and technology transfers to domestic competitors.
COMMODITY SUITABILITY	<ul style="list-style-type: none"> - Precious metals have short exploitation cycles, which result in less time to develop linkages - The oil and gas sector is characterised by more state owned companies, which may be used as a tool to create knowledge and technology linkages
REQUIRED INFRASTRUCTURE AND SKILL LEVEL	<ul style="list-style-type: none"> - This linkage is mainly dependent on existing expertise and absorptive capacity.
EMPLOYMENT	<ul style="list-style-type: none"> - Highly adaptable workforce will avoid long term unemployment due to structural changes in the economy
GENDER	<ul style="list-style-type: none"> - N/A
MAIN POLICY MEASURES	<ul style="list-style-type: none"> - <u>Tailor intellectual property rights to the country context</u> - <u>Promote joint research centers and programmes with universities</u> - <u>Encourage joint ventures with technologically advanced companies</u>
RECOMMENDATIONS (CHAPTER 4)	<ul style="list-style-type: none"> - EI Companies: 1,2,3,4,7,8 - Governments: 1,2,3,4,5,6,8,9,10 - Development cooperation: 1,2,3,4,5,6,7,8,10

SWOT Analysis for knowledge and technology linkages

Strengths (internal):

1. The upstream-linkage and export channels of knowledge and technology transfers are in the self-interest of EI companies. The former leads to a reduction of operating expenditures in the country of operation and the latter leads other mine sites of international EI companies to benefit from potential technological advances as well.
2. It is hard for EI companies to prevent technology transfers through the demonstration-imitation and labour mobility channels.

Weaknesses (internal):

1. This linkage does not feature high on the government agenda. Illustrative of this observation is that only a limited number of local content legislations specifically and effectively address the need for technology transfers. This can partly be explained by the fact that technology transfers are not associated with tangible results and therefore politically less appealing.

2. The development of knowledge linkages highly depends on absorptive capacity. Most of the resource-rich developing countries supported by development cooperation have a significant knowledge gap, which makes technological transfer very difficult to achieve.

Opportunities (external):

1. The recent commodity slump has meant that EI companies are looking to cut costs and increase efficiencies by embracing new technologies. This may provide an opportunity for making the sector technologically more advanced, which in turn may result in increased spillovers.
2. Increasing focus on technology transfer in international development frameworks such as the recently adopted SDGs (see SDG 10).

Threats (external):

1. Investment treaties as explored in more depth in Chapter 3 can contain clauses that restrict prescriptive measures to leverage knowledge and technology transfers.
2. Knowledge and technology transfers are difficult to measure, which explains the lack of consensus in the academic community about whether technology transfers are occurring and how stringent IPR rules should be in order to foster technology transfer. This topic clearly needs more research.
3. While the EI sector's search for technological solutions is an opportunity for technologically advanced countries, it might be a threat for countries that suffer from low absorptive capacity, given that the knowledge gap may increase even further, thus making it more difficult to transfer knowledge and technologies (as also discussed in Chapter 3).

2.6 Side-stream Linkages: Spatial/ Infrastructure Linkages

Spatial (infrastructure) linkages relate to the benefits associated with the infrastructure developed for an EI project for other actors in the economy. Sharing or opening up access to essential resource-related infrastructure is one of the most viable ways by which the EI – and particularly mining or onshore oil & gas activities – can support the establishment of industries that will survive long after a country's mineral resources are fully exhausted.

EI projects require considerable infrastructure to meet their power, water and transport needs to extract, process and export the commodity. Traditionally, extractive companies build and operate their own infrastructure in an enclave model. The capital investment required to build or rehabilitate the required infrastructure can amount to a sizable portion of the overall capital expenditures required to develop an EI project. For example, it is estimated that, for bulk mineral projects – such as iron ore, which requires a railway line and port for export purposes – the development of transport infrastructure alone represents around 60% of the total capital expenditure for developing a greenfield project (McKinsey Global Institute, 2013). At times of depressed commodity prices, such huge capital requirements can render an EI project economically unviable.

At the same time, resource companies often operate in resource-rich, low- to middle-income countries where there are huge infrastructure gaps that can make it more challenging to transform resource wealth into long-term development (CCSI, 2014). The resource-related infrastructure investments therefore present an opportunity to leverage such extractive companies' investments in infrastructure for broad-based economic development. This can be achieved by either investing fiscal revenues in long-term infrastructure assets (fiscal linkages), or by requiring the shared use of or open access to resource-related infrastructure. In addition, where the shared use of transport-related resource infrastructure (roads or optic fibre cables along the accompanying right-of-way⁴⁰ of a railway line or pipeline) results in the development of resource corridors, investments in last mile or feeder projects to connect actors that operate along such resource corridors can further widen the scope of the anchor resource infrastructure, thereby multiplying the spatial linkages (Ramdoo 2015).

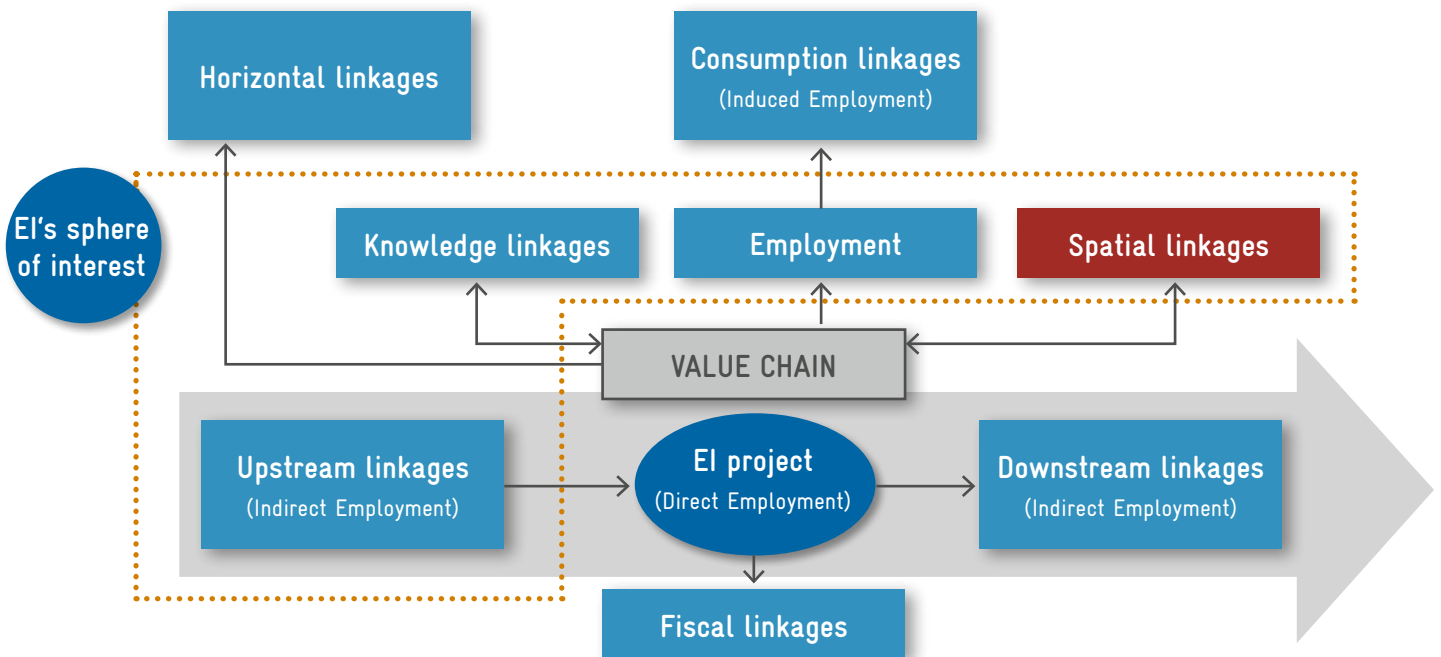
Figure 2.21: SWOT Analysis of knowledge linkages



Source: Authors

⁴⁰ A right-of-way or servitude is a type of easement granted or reserved over the land for transportation purposes. An example of a right-of-way would be the land on which a railway line or pipeline is located. There is scope to lay other types of infrastructure (optic fiber cables, power lines, etc.) along these rights-of-way.

Figure 2.22: Spatial linkages



Source: Authors

The concept of “shared use” in an EI context refers to the opportunity to have resource-related transport, power, water, or ICT infrastructure benefit multiple (resource and non-resource) users. Multi-purpose projects, whereby infrastructure is designed and operated to accommodate both EI and non-EI users allows a wider range of stakeholders to access and benefit from the infrastructure. This, in turn, can facilitate the development of upstream and downstream linkages where the lack of adequate infrastructure has prevented SMEs from being able to manufacture or transport their goods, or to communicate with the mines in an affordable manner.⁴¹

However, not all types of commodities provide the same opportunities for shared use or open access infrastructure given that different EI projects have different infrastructure requirements. As illustrated in the figure on the next page, for example, not all types of minerals require the construction of railway lines. Rail transport is generally only suited for bulk commodities that need to be transported over long









distances. Similarly, offshore oil deposits will not require much onshore infrastructure to be built and may have little scope for developing spatial linkages.

Similarly, different types of commodities have different water and power requirements. As illustrated in the figures on the next page, while some commodities that require considerable processing like copper and gold are both water and power intensive, other commodities like iron ore and coal only require water for dust suppression and, in the case of coal, washing of the coal, thus requiring much less water and power overall.

It is also very important that a careful cost-benefit analysis is done before imposing shared infrastructure requirements on a particular EI project. As can be seen in the figure on the next page, the benefits and related costs of sharing different types of infrastructure vary substantially across projects and commodity types. For rail and port infrastructure, the costs of sharing are among the highest, whereas for power (and ICT, which is not reflected in the figure), the range of benefits from adopting a shared-use arrangements is often larger than the associated costs.








⁴¹ In a 2013 report, McKinsey Global Institute estimated that as much as US\$2 trillion of EI-related investments in infrastructure could benefit from some form of shared use between 2013 and 2030. It estimates that nearly 70 % of infrastructure investment could be multi-user, and the remaining 30 % could be multi-purpose (McKinsey Global Institute, 2013).

Figure 2.23: Transport linkage potential by commodity

MINERAL	2010 WORLD PROD. (MN METRIC TON)	AV. PRICE PER TON (2010 US\$)	AFRICA'S POTENTIAL	PREFERRED TRANSPORT MODE
Bauxite, Alum	211	27	++	
Phosphate	176	50	++	
Iron Ore	2,400	90	+++	
Coal	7,200	165	+++	
Cooper	16.2	7,694	++	
Cobalt	0.088	46,297	++	
Gold	0.0025	38.5 mn	++	
Plantinum	0.000183	51.4mn	++	

Source: "IFC presentation at Indaba (2013), Fostering greenfield mining-associated shared transport infrastructure through PPPs: Challenges and Solutions for sub-Saharan Africa

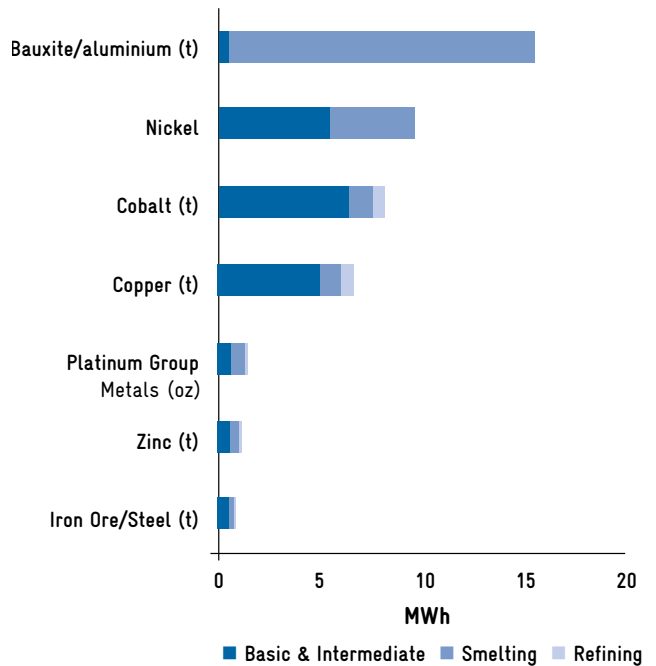
Figure 2.24: Water linkage potential by commodity

MINERAL/METAL TYPE	WATER USE
Coal	
Cooper	
Diamond	
Gold	
Nickel	
Iron ore	
Plantinum	

Key:  High  Medium High  Medium Low

Source: Frost & Sullivan (2012), CEO 360 Degree Perspective of the Global Mining Water and Wastewater Treatment Market.

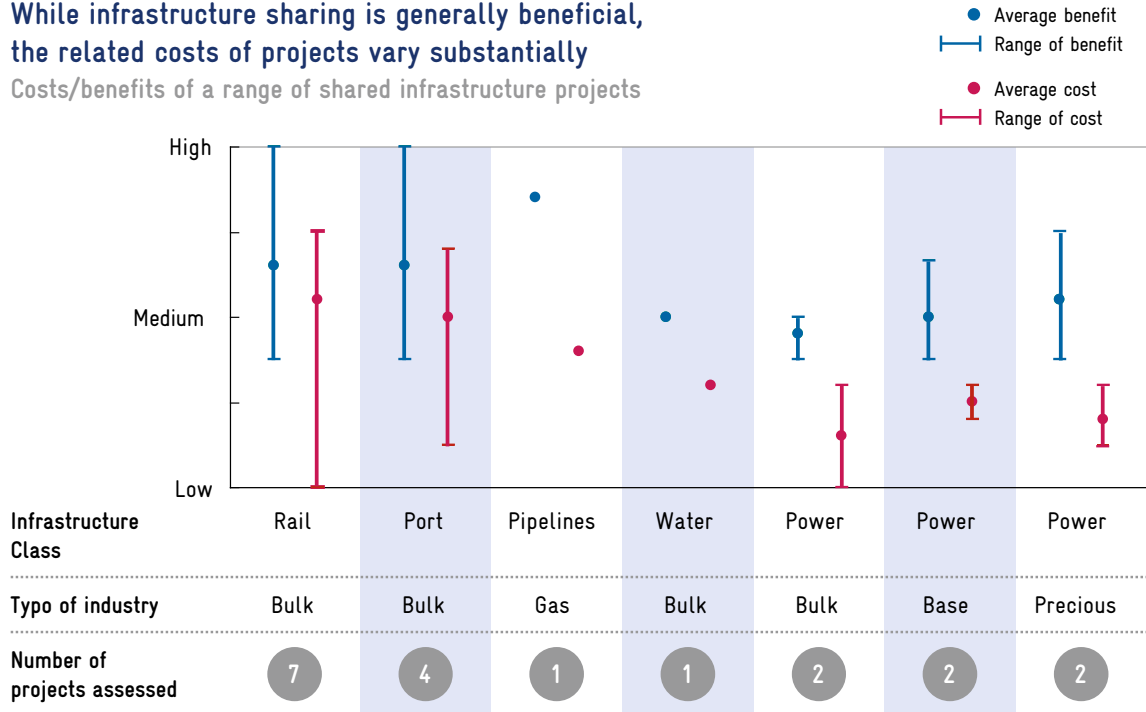
Figure 2.25: Power linkage potential by commodity



Source: World Bank, Banerjee, S. G., Romo, Z., McMahon, G., Toledano, P., Robinson, P. and Pérez Arroyo, I (2015), The Power of the Mine.

Figure 2.26: Costs and benefits of sharing infrastructure

While infrastructure sharing is generally beneficial, the related costs of projects vary substantially
 Costs/benefits of a range of shared infrastructure projects



Source: McKinsey (2013), Reverse the curse: Maximizing the potential of resource-driven economies.⁴²

2.6.1 Literature review and case studies

Adequate public infrastructure is an essential component of the type of enabling environment required to foster business development and productivity (Sigam and Garcio, 2012). Inadequate infrastructure prevents the expansion of local industry and limits the scope of upstream and downstream linkages developing around the EI sector (Ireland, 2015).⁴³ However, many governments lack human and financial resources to construct, rehabilitate and maintain the transport, power, water, and ICT infrastructure required to meet the demands of their rising populations and foster the development of local industry, in particular through upstream and downstream linkages (as explained in Sections 2.2 and 2.3). In such a context, negotiating and implementing shared use or open access arrangements with EI companies regarding the infrastructure they require to operate can help to facilitate spatial linkages from EI investments.

42 Exhibit from "Reverse the curse: Maximizing the potential of resource-driven economies", December 2013, McKinsey Global Institute, www.mckinsey.com. Copyright (c) 2013 McKinsey & Company. All rights reserved. Reprinted by permission.
 43 The lack of adequate infrastructure also affects investors' decision to develop natural resources to begin with. In the current climate of low and volatile commodity prices, the huge capital costs associated with the construction of the rail and port infrastructure required to exploit and export some of the greenfield iron ore and bauxite reserves in West Africa, for example, has resulted in their development being delayed or put on hold indefinitely (Ireland, 2015).

Transport infrastructure

Opening up access to the resource-related transport infrastructure built by mining companies or the roads located in the rights-of-way upon which oil and gas pipelines are located can support SMEs by facilitating the transport of their goods or personnel around areas inadequately serviced by public infrastructure as well as trade more generally. This can have a particularly positive impact from a gender perspective, as women, who are less likely to be directly employed in EI projects, can benefit from the infrastructure to transport of agricultural produce or supply services they are more likely to be involved in.

However, while very attractive in principle, the financing, coordination and regulation of shared railway infrastructure in particular can be difficult to execute and there are few successful examples of shared mining-related rail infrastructure. From a financing perspective, shared railway infrastructure can render a project less "bankable" if there is a risk that opening up access to that railway line to other users could result in operational inefficiencies and delays. This is particularly important if the ownership of the infrastructure

is separated from that of the mining concession, and the major mining company loses some operational control over the infrastructure. Shared use of transport infrastructure also requires a strong regulator to moderate access, set tariffs and adjudicate disputes.

A prime example of such a shared-use transport infrastructure arrangement are railway line, port and feeder roads planned to be built in connection with Rio Tinto's Simandou iron ore project in the Republic of Guinea, wherein the IFC has a 5% equity stake in the Guinean-incorporated company, Simfer SA, that holds the development mining licence for the project.

Box 2.18: The Simandou Southern Growth Corridor in Guinea

The Simandou mountain in northwest Guinea range is home to some of the most substantial premier grade and, as of yet, untapped iron ore reserves in the world. First discovered in 1997, the infrastructure challenges associated with extracting and exporting the ore has meant that the deposits have yet to be developed. The shortest export route for the iron ore would be through Liberia. However, at the insistence of the Government of Guinea and with the assistance of the IFC, Rio Tinto agreed to build a railway line through Guinea instead of Liberia to export the iron ore along the "Southern Guinea Growth Corridor". The Southern Guinea Growth Corridor is an area wherein linkages between agriculture and aquaculture, services, trade and other export industries and Rio Tinto's anchor railway, port and road infrastructure are planned to develop (Bastida 2014).

In May 2014, Rio Tinto – which holds a majority stake in the company, Simfer SA, which holds the development license with respect to blocks 3 and 4 of the Simandou iron ore deposits – entered into an Investment Framework with the Government of Guinea, the Aluminium Corporation of China (Chinalco) and the IFC to

develop the Simandou deposits. A separate infrastructure agreement was signed between the parties to procure the financing for, construct and operate a 650km multi-purpose trans-Guinean railway line from Simandou in the northwest of the country to a greenfield deep-water port south of Conakry, thus linking up a highly fertile agricultural region and adding shipping capacity.⁴⁴ Over 1,000km of roads are also planned to be constructed or rehabilitated along the corridor, which will be open to use by the public and will serve to connect passengers and SMEs to the railway line from local villages. Preliminary estimates suggest that this Southern Guinean Growth Corridor could unlock US\$ 3 billion worth of economic activity per year (Rio Tinto, 2015).

However, since the conclusion of the Investment Framework and infrastructure agreements, little progress seems to have been made to raise the capital required to develop the project, which is anticipated to cost around US\$20 billion. The rail and port infrastructure alone accounts for nearly two-thirds of the estimated costs and, given the current slump in commodity prices, there is little appetite for a project that requires such a high capital investment. Whether this project does indeed create the spatial linkages it has set out to create therefore remains to be seen when the mining project is eventually developed.

Multiple lessons can be learnt from the **Guinea** case study: (1) it shows the role that financial development cooperation can play in developing resource projects and associated infrastructure (see recommendation D3); (2) it highlights potential that spatial linkages have in terms of contributing to economic development, but also how complex and costly these are to implement (see recommendations E2, E3, G7); and (3) it shows the political economy that is at play in such large projects, which has resulted in the Guinean government not allowing for the railway line to go through Liberia, which was the route preferred by the investors (see recommendation D10).

The case study also exemplifies the challenges of raising the financing for the transport infrastructure requirements of a large bulk commodity mine when the ownership of the infrastructure is separated from the mine assets and the jurisdiction lacks a strong or independent regulator to implement the shared-use arrangement. While requiring all

⁴⁴ Government of Guinea, Rio Tinto, Chinalco and the IFC Joint Press Release: "Simandou South: Signature of the Investment Framework Marks a Significant Move Forward," May 26, 2014, available at: http://www.riotinto.com/media/media-releases-237_10508.aspx. See also: Di Boscio N, Slade M, Ward J: "Digging deeper for development: the case of Simandou and the Southern Guinea Growth Corridor." (2014), available at: <http://link.springer.com/article/10.1007%2Fs13563-014-0052-x>.

transport infrastructure to be open access, governments need to carry out a proper cost-benefit analysis before requiring shared use of all types of shared infrastructure, and particularly railway lines. The tax concessions a government will need to make for a major mining company to agree to shared use may outweigh the benefits of a multi-purpose railway line. In such a case, a host government may be better off just retaining the right-of-way on which a railway line is located, so that roads and other types of infrastructure can be built alongside it.

Power infrastructure

Mining demand for power can be leveraged to either improve or expand the transmission and generation capacity of the national or regional grid or a power generation plant constructed for a mine can be used to supply low-cost electricity to local communities or the nation's grid, thus improving living standards and fostering the business environment. The case study below describes how Katanga copper mining's power requirements have been leveraged to improve the power system in the **Democratic Republic of the Congo (DRC)**.

Box 2.19: How Katanga copper mining's power requirements have been leveraged to improve the power system in Democratic Republic of Congo

The DRC has great hydropower potential; the Inga hydro-power site on the Congo River alone has an estimated potential to produce 40,000MW. However, at present, the DRC only has an installed capacity of 1,775MW, with an electricity grid that reaches 11% of the population and suffers from intermittent electricity supply and regular power outages (World Bank, 2014). Therefore, the country relies heavily on back-up diesel generators, which are significantly more expensive and limit the growth potential of small businesses that cannot afford to sustain the losses associated with regular power cuts or operate generators for long periods of time. The power shortages and unreliable power supply have also affected the energy-intensive copper mining industry in the south-east of the country, which accounts for 30% of the DRC's GDP and 80% of its export revenues and exploits one of the largest copper deposits in the world.⁴⁵

The regular power outages, coupled with the high cost of diesel, mean that less copper is produced at a higher cost. This in turn means that the country forgoes tax revenues that would otherwise have been generated from copper exports. In a recent study, the World Bank estimated that in 2012 power shortages resulted in a loss of 250,000 tons of copper, which translated into lost exports worth US\$1.8 billion, a loss in GDP of US\$700 million (4.4% of GDP) and a loss in tax revenues of US\$250 million (1.6% of GDP) (World Bank, 2014).

Given the long-term nature of the mining operations and their consistent power needs, a number of mines, including those operated by GlencoreXstrata Plc, have agreed to invest in SNEL as well as to upgrade the national electricity grid through a series of measures including the repair of two turbines at SNEL's 1,424MW Inga 2 hydro-power plant and improve about 2,000 km of transmission lines to provide power to Katanga. By doing so, the mines will ensure they have a better, cheaper and more reliable power supply. At the same time, SNEL will benefit from improved infrastructure and will be better placed to support the supply of cheap hydropower to other sectors and users in the economy.

The **DRC** case study highlights the potential benefits of public-private partnerships or cooperation between the Government and the EI sector to improve power access to the country and at the same time lower the operating costs for the mining companies (see recommendations E2, E3, G7, G8).

Water infrastructure

Similar economies of scale can be achieved with regard to water distribution and treatment infrastructure, whereby mining-related investments in water infrastructure are made with a view to benefit a wider range of stakeholders than just a single mine. Large volumes of water are required at each phase of the mining process to suppress dust, process and mine ore, cool and wash mining equipment, manage waste tailings, and for consumption by mining communities. Yet, mining companies increasingly find themselves operating in water-stressed environments where there is a physical

⁴⁵ More information can be obtained here: <http://www.mineweb.com/mineweb/content/en/mineweb-political-economy?oid=232081&sn=Detail>

shortage of fresh water, and considerable investment in water infrastructure is required to ensure a reliable water supply for mining operations (CCSI, 2014). Estimates suggest that the mining sector's global annual expenditure on water-related infrastructure in 2011 was \$7.7 billion (Thomas, 2011).

In the context of community concerns that mines are draining available water resources or are polluting or altering the course of existing water sources in areas where access to adequate and safe water resources for the local population may be inadequate, there may be scope for mines to collaborate with local or national water utilities to supply mine treated water to a local authority for onward distribution (such as Anglo American's eMahlaheni reclamation project in South Africa), or to upgrade the water treatment

and distribution capacity of the local water authority as was the case with Freeport McMoran's Cerro Verde mine in Arequipa, Peru (see case study below). While such arrangements can go a long way for a mine to obtain a social license from the surrounding communities, the initiatives do not necessarily need to be done on a CSR basis. As in the cases of Anglo American and Freeport McMoran, the treated water can be provided for a small fee (covering at least the operation and maintenance costs of supplying such water). Instead of making the investments or upgrades themselves, mining companies could also provide the necessary demand by way of a long water off take agreement⁴⁶ to a water authority in order to help the water authority obtain the external financing for an upgrade of its water infrastructure required to serve both the mines and other users.

Box 2.20: The experience of Freeport McMoran in Peru with shared water infrastructure

Freeport McMoran's Cerro Verde mine is an open-pit copper and molybdenum-mining complex located near the city of Arequipa in southern Peru. The mine is a zero-discharge facility that recycles approximately 85% of the water used in the mining process. The company, however, plans to expand and triple its production; in order to do so, the project will require an 85% increase in its water requirements. At the same time, access to clean water in the region is a major challenge. The main source of water supply, the Rio Chili, has become contaminated because of untreated sewage discharge and there is insufficient wastewater treatment capacity in the region.

In 2011, the mining company thus proposed to supply the additional water requirement through a new wastewater treatment plant with excess capacity reserved for communities. By avoiding a deterioration of Rio Chili's water quality due to polluting discharges, the project would also improve agricultural productivity in the area and reduce water-related diseases. It will also be a long-term source of treated water for mining operations. The Regional Government of Arequipa, the National Government and SEDAPAR (Servicio de Agua Potable y Alcantarillado de Arequipa S.A) agreed with Freeport McMoran that the mine will finance the engineering and construction of the wastewater treatment plant and that the plant will be operated by SEDAPAR. Construction started in 2013.

The Peru case study shows how spatial linkages can be created in the water sector. Close collaboration with national and local authorities is necessary for such linkages to be created (see recommendations E2, G7, G8).

ICT infrastructure

Economies of scope can be achieved when one type of infrastructure facilitates the development of another type, such as placing fibre optic cables or utility lines alongside power lines or in the right-of-way of a railway line, road, or oil & gas pipeline to benefit a greater number of economic actors. In fact, with regard to fibre optic networks, it is estimated that civil works represent around 80% of total roll-out costs, so co-locating fibre optic cables alongside existing infrastructure

can result in a reduction of the capital investment costs of using a fibre optic network.⁴⁷ Examples of this include CEC Liquid Telecom's laying of fibre optic lines along the power lines of the mines in the Zambian copper belt.⁴⁸ Similarly, in Malaysia, Celcom, a major telecommunications company, partnered with Petronas, Malaysia's state owned oil company, to build Celcom Petro Network, an installation of fibre optic network cables that addressed Petronas' telecommunication needs and provided spare capacity that could be leased to other mobile operators, ISP and corporate customers. The system runs parallel with the National Gas Pipeline and contains nearly 1,400km of extension (covering nearly 90% of the country) (Toledano & Roorda, 2014).

46 An offtake agreement is an agreement between a producer and a buyer to purchase/sell portions of the producer's future production. It is usually negotiated prior to the construction of a facility such as a mine in order to secure a market for the future output of the facility.

47 Fibre to the Home Council Europe: "White Paper: Innovative FTTH Deployment Technologies," (2014), available at: http://www.ftthcouncil.eu/documents/Publications/DandO_White_Paper_2_2014.pdf. Also see http://www.unescap.org/sites/default/files/6_Cross-sector%20ICT%20Infrastructure%20for%20Asia_Abu%20Khan.pdf

48 Interview with corporate expert, July 2015.

In the oil & gas sector, the right-of-ways along pipelines are particularly suited to being shared with other types of infrastructure, although a clear regulatory framework to both allow and facilitate the leveraging of economies of scope

along pipelines is important. An example of a country with a strong regulator is Brazil, which uses regulation and adjudication to facilitate and implement shared use arrangements, as can be seen with regard to the Bolivia-Brazil Pipeline.

Box 2.21: The use of rights of way in Brazil along the Bolivia-Brazil gas pipeline

The Bolivia-Brazil Pipeline (GASBOL) provides a good example of the scope for cross-border shared infrastructure in the oil and gas context as well as the importance of strong regulatory oversight.⁴⁹ The 3,150km long pipeline transports natural gas from Bolivia to Brazil.⁵⁰

Bolivia’s and Brazil’s cooperation with respect to the cross-border pipeline was formalised on August 17, 1992 with the conclusion of a Brazil-Bolivia Agreement on Natural Gas Supply.⁵¹ In addition to setting out that the countries’ state-owned oil enterprises, Yacimientos Petroliferos Fiscales Bolivianos (“YPFB”) and Petroleo Brasileiro S.A. (“Petrobras”), would establish by contract the terms for the construction of the pipeline and the sale of natural gas, the agreement specifies regional integration as one of its aims and states that the Bolivian Government will allow the transit of natural gas from other countries towards Brazil by giving the transit the right-of-way in Bolivia.

GASBOL became operational in February 1999 and is managed by Gas Transboliviano S.A. (GTB) on the Bolivian side and by Transportadora Brasileira Gasoduto Bolívia-Brasil S.A. (TGB) on the Brazilian side. In Brazil, natural gas as well as the infrastructure associated with it are regulated by the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP), which has collaborated with other regulators to leverage economies of scale from GASBOL, among else by ensuring that electricity and telecommunications lines can be built alongside the gas pipelines. Most notably, in 1999 ANP and its counterparts in the electricity sector, ANEEL, and in the telecommunications sector, ANATEL, issued a joint resolution on the shared use of infrastructure which determines the sharing of rights-of-way for utility lines, pipelines, posts, and towers. More recently, ANP issued another resolution in order to regulate shared use of the right-of-way of pipelines between the oil & gas sector and biofuel companies.⁵² Pursuant to this 2012 resolution, TGB is required to guarantee access to GASBOL’s easement over the land on which the pipeline is located as long as there is excess capacity for shared use. Any party wishing to request access to the easement for the construction of additional infrastructure just has to submit a request to TGB, and can then appeal to ANP for intervention if TGB refuses to grant the request.⁵³

The **Brazil** case study highlights how cross-border infrastructure projects may help realize potentials for regional integration (see recommendation G9). It also shows the importance of a regulatory framework that allows enforcement of shared infrastructure use and the necessity of a strong regulatory authority (see recommendations G7, D1)

49 The 1992 Note on Natural Gas Sell Agreement states that “the decision of both the Bolivian and Brazilian governments to enter into the gas pipeline will not only benefit the development of both countries, but also decidedly contribute to Latin America regional integration. Therefore, a project like this pipeline is a priority for the South Cone region,” available at: http://dai-mre.serpro.gov.br/atos-internacionais/bilaterais/1992/b_38_2011-10-14-15-30-18/
50 TGB, “Gas Pipeline – Technical Information,” available at: http://www.tb.com.br/pt_br/o-gasoduto/informacoes-tecnicas.htm.
51 See: Brazil. 1992 Note on Natural Gas Sell Agreement, available at: http://dai-mre.serpro.gov.br/atos-internacionais/bilaterais/1992/b_38_2011-10-14-15-30-18/ and Brazil. Decree 681/1992 that provide the Brazil-Bolivia Agreement on Natural Gas Supply, available at: http://www.planalto.gov.br/ccivil_03/decreto/1990-1994/D0681.htm

52 ANP. Resolution 42 of 12/10/2012, available at: [http://nxt.anp.gov.br/NXT/gateway.dll/leg/resolucoes_anp/2012/dezembro/ranp%2042%20-%202012.xml?fn=document-frameset.htm\\$f=templates\\$3.0](http://nxt.anp.gov.br/NXT/gateway.dll/leg/resolucoes_anp/2012/dezembro/ranp%2042%20-%202012.xml?fn=document-frameset.htm$f=templates$3.0)
53 Art. 22 of ANP Resolution 42 of 12/10/2012, available at: [http://nxt.anp.gov.br/NXT/gateway.dll/leg/resolucoes_anp/2012/dezembro/ranp%2042%20-%202012.xml?fn=document-frameset.htm\\$f=templates\\$3.0](http://nxt.anp.gov.br/NXT/gateway.dll/leg/resolucoes_anp/2012/dezembro/ranp%2042%20-%202012.xml?fn=document-frameset.htm$f=templates$3.0)

2.6.2 Lessons learned from the literature and case studies⁵⁴

Failing to leverage EI-related investments in infrastructure to address the lack of public infrastructure is a missed opportunity for governments to maximize the development gains of such projects. Leveraging EI-related investments to benefit a wider range of stakeholders than just a single EI company could help narrow this gap. However, given that the EI sector often operates in an enclave model, investments in physical infrastructure are often uncoordinated with national infrastructure development plans. The country therefore misses the opportunity to promote the shared use of the infrastructure and to take advantage of potential synergies.

A master infrastructure plan or national planning across sectors that takes into account the infrastructure requirements of the EI sector can mitigate some of the risks by identifying multiple opportunities, users or purposes before contract negotiations or tendering the concession. Once there is a single user for infrastructure, it is more challenging

to require shared use. By anticipating different scenarios and circumstances, governments can also assess other options, such as negotiating for higher tax revenues to invest in public infrastructure projects.

While there is considerable scope for sharing at least some of the infrastructure required for EI projects to operate, the scope for shared use can vary substantially, depending on the type of infrastructure and industry it was developed for. A full cost-benefit analysis therefore needs to be undertaken to determine to what extent the imposition of shared use for each type of infrastructure should be required. For more information on the types of issues to take into account for each type of infrastructure in such a cost-benefit analysis, please see CCSI's "Framework to Approach Shared-Use of Mining Related Infrastructure."⁵⁵ There is often a lack of local capacity to carry out this cost-benefit analysis and technical cooperation could help enhance this capacity.

Table 2.5: Summary of key characteristics of spatial linkages

BENEFITS	<ul style="list-style-type: none"> - Help address the infrastructure financing gap - Infrastructure is key to develop the economy and other linkages - Social benefits from access to infrastructure
DRAWBACKS	<ul style="list-style-type: none"> - Sharing is not always economically feasible and difficult to implement – especially when it comes to railway infrastructure
COMMODITY SUITABILITY	<ul style="list-style-type: none"> - Bulky low value commodities require railways - Precious metals will require a lot of water - Oil and gas least suitable for spatial linkages other than through economies of scope along roads and pipelines
REQUIRED INFRASTRUCTURE AND SKILL LEVEL	<ul style="list-style-type: none"> - Requires strong public utilities to serve as viable partners to the companies.
EMPLOYMENT	<ul style="list-style-type: none"> - Improved infrastructure access is likely to lead to increased economic activity and thereby more jobs.
GENDER	<ul style="list-style-type: none"> - N/A
MAIN POLICY MEASURES	<ul style="list-style-type: none"> - Develop a national infrastructure master plan that takes EI sector investments into account - Devise shared-use and open access policies - Prepare cost-benefit analyses to determine in which cases EI sector infrastructure investments should be shared - Setup an independent regulatory agency to oversee and implement open access policies
RECOMMENDATIONS (CHAPTER 4)	<ul style="list-style-type: none"> - EI Companies: 1,2 - Governments: 1,2,7,8,9 - Development cooperation: 1,2,3,5,10

54 For more detailed recommendations, please consult: CCSI: "A Framework to Approach Shared-Use of Mining-Related Infrastructure" (March 2014), available at: http://ccsi.columbia.edu/files/2014/05/A-Framework-for-Shared-use_March-2014.pdf.

55 Ibid.

SWOT Analysis for spatial linkages in Africa:

Strengths (internal):

1. In many cases, resource –related infrastructure offers clear economies of scale and scope, which in turn enable spatial linkages.
2. To save their social license to operate, companies may be willing to share infrastructure.

Weaknesses (internal):

1. Lack of coordination between the mining sector’s infrastructure investments and national infrastructure plans.
2. Not all types of mining projects are suited for infrastructure sharing.
3. Mining companies prefer to operate infrastructure in an enclave model.
4. Weak regulatory institutions to regulate shared use infrastructure.

Opportunities (external):

1. High on the agenda of international development cooperation.
2. Increasing guidance on how to operationalize shared-use infrastructure.
3. Regional integration improves the business case for cross-border resource corridors.
4. Low commodity prices may push EI companies to share the costs associated with infrastructure investments.

Threats (external):

1. Banks may be less willing to finance mining projects where the infrastructure assets are being shared with other users.
2. Extractive companies are cautious due to concerns about operational inefficiencies.

Figure 2.27: SWOT Analysis for spatial linkages



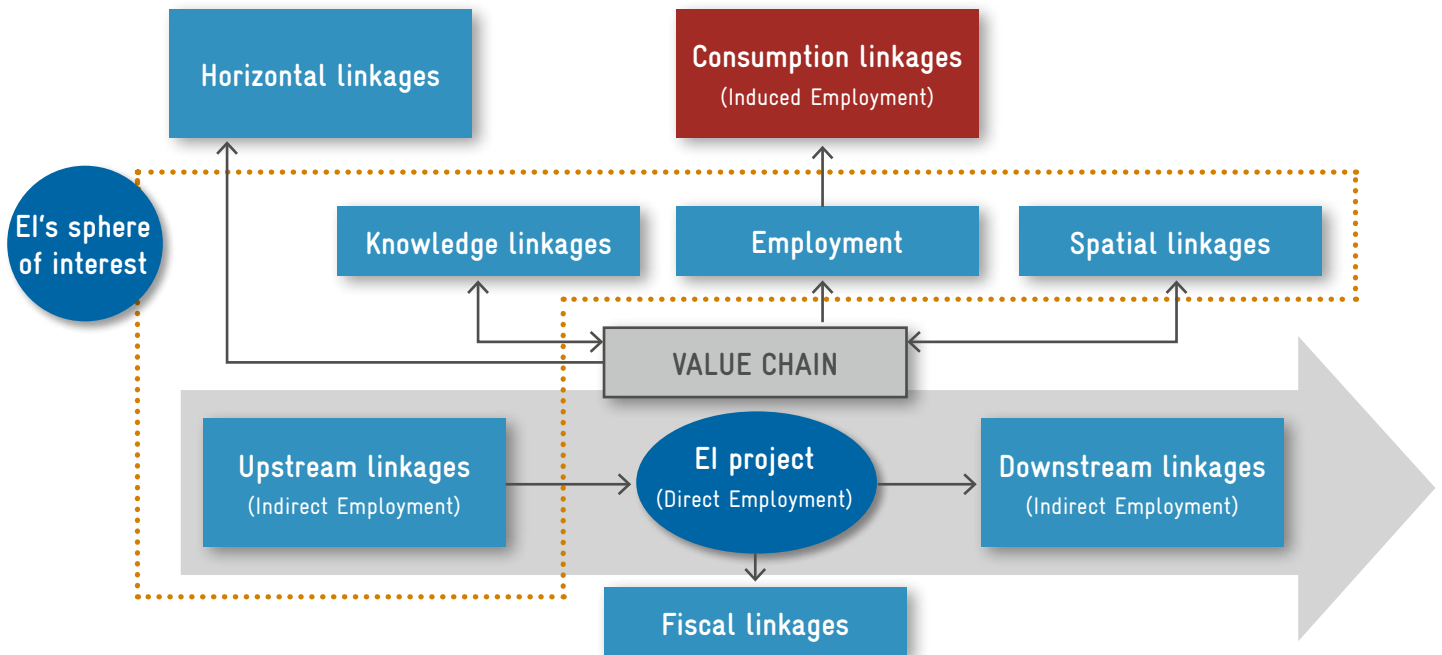
Source: Authors

2.7 Consumption linkages

Consumption linkages relate to the demand for goods and services resulting from the spending of earnings from the EI sector.

Little analysis has been done on consumption linkages. This is partly because they are notoriously difficult to identify and quantify, and the types of consumption surveys that are sometimes carried out – such as in relation to the Escondida copper mine in Chile – are usually too limited in scope. This limitation occurs either because the surveys just focus on resident employees rather than including commuters or because they only have examined workers that arrived when EI activities began and did not include residents that predated EI activities to see whether they had benefited from induced employment. The creation of jobs in the informal sector is also not adequately considered in these assessments (Östensson, 2014).

Figure 2.28: Consumption linkages



Source: Authors

2.7.1 Literature review and case studies

Writing in the context of the 1970s when markets were heavily protected, Hirschman (1981:75) noted that the demand for goods and services generated by employees – and those owning the means of production – in the EI sector had the potential to provide a major incentive for local industrial production and manufacturing (Kaplinsky, 2011). This is not only because the incomes generated in the EI sector were high, but also because of the sizeable share of domestic cash incomes they represented when other sectors were relatively underdeveloped (Kaplinsky, 2012).

In addition to consumption linkages created from the incomes of those *directly* employed in the EI sector, Hirschman argued that consumption linkages could also be generated *indirectly* through the incomes of both those providing upstream inputs for the EI sector and those processing commodities domestically downstream. To the extent that such suppliers are local, there is a multiplier effect as incomes generated in the EI sector are spent in the domestic economy. Thus the incomes – both direct and indirect – generated by the EI sector have, as Hirschman concluded, the potential to drive the creation of a domestic market for goods and services (Kaplinsky, 2012) (and what is also referred to as *induced employment*). Induced employment can account for

considerably higher employment numbers than employment created directly by the EI sector. For example, the International Council on Mining & Metals (ICMM) has reported high induced employment at mines like the Sepon mine in Laos (13,110 induced jobs as compared to 3,155 directly employed by the mine)⁵⁶ and the Obuasi mine in Ghana (20,000-50,000 induced jobs versus 1,000-5,000 directly employed).⁵⁷ However, the induced effect of direct and indirect employment is lessened if an EI company provides its employees with accommodation, food, and other services, which reduces the amount that workers spend on such services (but may increase upstream linkages if sourced from local suppliers).⁵⁸

56 ICMM, "Utilizing Mining and Mineral Resource Endowments to Foster Sustainable Development of the Lao PDR," (July 2007), available at: <http://www.icmm.com/document/1841>.

57 ICMM, "Ghana Country Case Study: The Challenge of Mineral Wealth: Using Resource Endowments to Foster Sustainable Development," ICMM (July 2007), available at: <http://www.resourcegovernance.org/sites/default/files/Country%20Case%20Study%20Ghana.pdf>. See also the forthcoming CCSI working paper: "Employment from Mining and Land-Based Agricultural Investments: How Much Myth, How Much Reality?"

58 Forthcoming CCSI working paper: "Employment from Mining and Land-Based Agricultural Investments: How Much Myth, How Much Reality?"

As explained above, at the time Hirschman wrote his hypothesis, most resource-rich developing countries were inward-focused with import-substitution industrialization policies that sought to limit imports. **Chile**, for example, targeted

consumption linkages by increasing the price of imported goods through tariffs and non-trade barriers, as set out more fully in the box below (Sachs, L. and Maennling, N., 2015; Silva, 2007).

Box 2.22: Chile's import substitution industrialization policy

Import substitution industrialization (ISI) in Chile, as in other Latin American countries from the 1930s to the 1960s, replaced the commodity-export-led development model that had been in place during the first half of the 20th Century. The Great Depression of 1929, followed by the Second World War, resulted in flat demand from Europe and the U.S. for the primary goods being exported from Chile. It was determined that, in order to grow the economy and address high unemployment, Chile would need to start its own industrial base.

ISI relied on state-led efforts to develop local industries and manufacturing to replace imported manufactured goods, coupled with high tariff barriers, quotas and exchange controls to protect its nascent industries (Sapelli, 2003). In 1939, the Chilean Government of Pedro Aguirre Cerde created the Corporacion de Fomento de la Produccion (Chilean Development Corporation – CORFO), which designed and implemented Chile's industrial policy in the 1940s and 1950s. The Chilean Government associated the expected increase in production and competitiveness with consumption linkages from other local industries. It built up a portfolio of non-traditional manufactured goods in textiles, clothing and footwear, chemical products,

non-metallic mineral products, and metallic products by planning and subsidizing targeted industries, encouraging public private partnerships to develop infrastructure, and protecting these nascent local industries with high tariffs and exchange rate policies.

However, in planning which local industries to support, CORFO did not adequately assess which goods and services would benefit the country's mining sector or could be targeted to foster upstream and downstream linkages around it. Given that, at the time most inputs like machinery and parts were imported, the impact of ISI on the mining sector was therefore reflected in the higher prices the sector had to pay for those imports. However, as many of the mines were largely in U.S. hands at the time and were benefitting from preferential tax treatment, they were mostly able to absorb the additional costs of imports. Other sectors that had not been internationally competitive prior to the imposition of ISI policies fared less well. Chile's agricultural sector, for example, stagnated in the context of less competition from imports and more expensive agricultural inputs. Therefore, the expected increase in production and competitiveness of the agricultural sector associated with consumption linkages from other local industries such as mining did not materialize.

The **Chile** case study shows that while consumption linkages are more likely to occur when domestic goods are protected, ISI policies may actually harm the sector in the long run as companies are not exposed to competition and inputs need to be imported.

Once trade regimes were liberalized in the 1980s and 1990s, after Hirschman had drawn his conclusions, many of these consumption linkages “leaked abroad” through the importation of less expensive or higher quality goods and services, rather than reinforcing the demand for goods and services domestically produced (Kaplinsky, 2012). In such cases, the EI sector has fuelled consumption demand for industrial sectors in other countries rather than in the host country, showing a classical effect of Dutch Disease, whereby

the appreciation of the domestic real exchange rate makes the import of foreign goods comparatively less expensive. The consequence of this drop in support for the domestic industry has been a rapid rise in import intensity in virtually all resource-rich developing countries, exacerbated by the intense competition of cheap manufactured goods from China in particular, which in turn has been helped by the global decline in transport and logistics costs. In the case of Chile, by the early 1960s, most of the easy substitutions of simple imported goods had been made, and the process of import substitution was growing less dynamic. For example, between 1950 and 1960 the annual growth rate of real industrial production amounted to 3.5 %, less than half the growth of the previous decade.⁵⁹

⁵⁹ 50 years afterwards, it is clear that the opening of the Chilean economy as well as its powerful supplier programmes have been far more effective than the presented ISI policies in promoting linkages.

The degree of consumption leakages abroad depends on the extent to which tradable goods and services are produced domestically. Some products and local services benefit from various forms of “natural protective barriers” (Kaplinsky, 2011). For example, perishable food products are best consumed close to the point of production. Service industries that require local presence such as restaurants or local transport are not going to be sourced from abroad. Heavy low-cost products such as construction materials (cement, bricks, etc.) have a high transport to value ratio, which makes local production more attractive. Nevertheless, despite these examples of natural protective barriers, the effect of high

prices in the domestic market – often fuelled by the EI itself – or the absence of policies to facilitate the establishment of agricultural or manufacturing sectors to provide such produce or goods means that it even becomes cheaper, or sometimes even inevitable, to import such goods rather than producing them domestically. For example, one interviewee noted that in Liberia, where most farming is carried out on a subsistence basis, mines tend to source food from neighbouring Guinea and further afield to ensure a reliable supply of foodstuffs.⁶⁰ The box below illustrates what could be done to facilitate consumption linkages targeting agriculture produce.

Box 2.23: Targeting agricultural productivity of smallholder farmers in Mozambique

Mozambique’s Zambezi Valley includes the area in and between resource-rich Tete Province and the Nacala and Beira ports, which are connected by railway corridors. Low-income rural communities along the two corridors comprise about 80% of the population in the Zambezi valley, with farming being the main source of food and income for most households. However, most of the agriculture is farmed on a smallholder basis and agricultural productivity remains low. This population is unlikely to benefit from the development of Mozambique’s coal resources in Tete province unless investments are

made to promote inclusive and diversified agriculture-led growth along the corridors. By targeting the productivity of smallholder agriculture in the region in particular, such smallholder farmers could move from largely subsistence farming to producing produce for the national market (including upstream and consumption linkages from the EI sector). A number of multi-stakeholder initiatives and notably the Beira Agricultural Growth Corridor – a collaboration between government, mining companies, farming organizations and international development partners – have been set up to identify local potential supply opportunities along the Beira corridor and invest in them to develop linkages. However, only modest improvements have been evidenced to date (CCSI, 2011).

Mozambique’s case study illustrates that given the high proportion of the labour force involved in agriculture in most African countries (estimated at around 65% of the total labour force) and the high reliance of household incomes on this sector (estimated to be around 50%), government and company policies, as well as donor-related assistance to improve agricultural productivity in rural areas – and particularly in the resource corridors connected to extractive projects – could facilitate consumption linkages (Ramdoo 2015). Such policies could include the provision of access to finance, fertilizers, and seeds, for example, as well as R&D in agriculture.

It is noteworthy that such policies are also in the interest of EI companies to the extent that it can help save them their social license to operate. Companies usually can help support a range of economic activities that are not directly related to their core business. The decision about which economic activities to support should depend on existing expertise and prospects for those economic activities to succeed – both aspects that should be addressed in a social impact assessment. Given that in developing countries EI projects are often situated in regions where farming is prevalent and demand for agriculture produce is likely to increase resulting from increased economic activity, supporting farmers may be in the self-interest of EI companies.

60 Interviews with GIZ, West Africa, August 2015

Gender and consumption linkages

Gender can have both a positive and negative impact on the creation of consumption linkages. This is because the direct employment created by the EI sector traditionally favours men who are less likely than women to spend money on the family or household and more likely to spend disposable income on *luxury goods* such as alcohol, which, if imported, results in leakages abroad.⁶¹ A 2009 World Bank study on gender dimensions of the EI sector found that where women's livelihoods have been displaced by the EI sector and they are forced to rely on a male provider, overall household consumption may decrease. On the flip side, the low skill jobs indirectly created around the EI are often in professions dominated by women, e.g. catering, laundry, clothing, uniform supply and repair, agricultural produce, and administrative support.⁶² Where women have access to these jobs, consumption of household goods and provisions for the household has been found to increase.

2.7.2 Lessons learned from the literature and case studies

Kaplinsky argues that consumption linkages probably will not create a major source of industrial potential. The linkage relies on the availability of competitively priced domestic consumption goods and services, which are often not available in resource-rich developing countries.

To foster consumption linkages, governments could focus on:

- Requiring mining companies to carry out social impact assessments as a pre-condition for the issuance of a mining licence in order to gather better baseline data on local economic conditions. This would in turn provide governments with a basic understanding of what could be demanded as a result of the EI project spurring economic growth in the region (Östensson, 2014).
- Improving agricultural productivity of smallholders. The majority of the rural work force in most developing countries is engaged in small-scale farming, which could supply the EI sector directly or indirectly (Ramdoo, 2015).
- Supporting local industry in providing goods that have a high transport-to-value ratio such as cement, bricks and other construction materials for domestic consumption.
- Adopting initiatives such as tax credits or higher interest rates in saving accounts⁶³ to incentivize those employed

in skilled/ managerial positions in the EI sector to keep their earnings within the country rather than taking them offshore.

- Using fiscal linkages to create the infrastructure and public service delivery around the sector necessary to sustain the creation of a local economy which could be further expanded by EI-related consumption linkages.

There is little literature on what EI companies can do in relation to their core activities to target consumption linkages. However, EI companies may (1) collect better data on local consumption linkage potentials through social impact assessments prior to the start of mining activities (Östensson, 2014); and (2) support initiatives to foster local agricultural productivity growth and mining employees' consumption of local produce. Investing in the collection of better data and local produce initiatives could support not only the creation of consumption linkages but also the creation of upstream linkages.

SWOT Analysis for consumption linkages:

Strengths (internal):

1. Can be generated both directly (from the incomes of EI sector employees) and indirectly (through the incomes of those employed in upstream and downstream sectors).

Weaknesses (internal):

1. Reliant on availability of competitively priced domestic goods and services.
2. Dependent on development of upstream and downstream linkages.
3. The Dutch disease can hurt the competitiveness of a country's non-extractive sectors, thereby having an overall negative impact on domestic consumption linkages, which are replaced by cheaper imports.
4. Limited self-interest for EI company to support.

Opportunities (external):

1. The attention given to boosting the productivity of the agricultural sector in international policy frameworks (such as the SDGs) and agendas of development partners can contribute to the development of an agricultural sector.

Threats (external):

1. Availability of cheaper goods and services from abroad.

61 Eftimie, A., Heller, K., Strongman, J.: "Gender Dimensions of the Extractive Industries: Mining for Equity," World Bank (2009), available at: http://siteresources.worldbank.org/EXTOGMC/Resources/eifd8_gender_equity.pdf.

62 Ibid.

63 Further research into such policies is needed.

Table 2.6: Summary of key characteristics of consumption linkages

BENEFITS	- Largest potential for job creation (induced employment) among linkages.
DRAWBACKS	- Dutch disease as a result of the EI sector may adversely affect other sectors that could benefit from consumption linkages. - Limited role for EI companies to promote consumption linkages.
COMMODITY SUITABILITY	- Precious metals have short exploitation cycles that do not leave much time to develop linkages. - Given that direct and indirect employment numbers are higher in mining as opposed to oil and gas, the total induced employment numbers are also likely to be higher.
REQUIRED INFRASTRUCTURE AND SKILL LEVEL	- Requires a relatively diversified local economy that produces enough goods and services that can be consumed. Such economy will generally emerge from the existence of relatively good infrastructure and a diversified skill base.
EMPLOYMENT	- Induced employment, when correctly measured, is higher than direct and indirect employment. The multiplier in Ghana, for example, has been estimated at 28. - Better baseline data of local economic conditions collected prior to the start of mining activities would provide for better information on how to promote induced employment.
GENDER	- In developing countries, the construction and agriculture sectors can be targeted by policies seeking to increase consumption linkages. The former tends to be male dominated, while in many cultures the latter may see female employment increase.
MAIN POLICY MEASURES	- <u>Improve collection of baseline consumption data,</u> - <u>Support sectors that are geographically bound - Encourage workers and companies to keep earnings domestically.</u>
RECOMMENDATIONS (CHAPTER 4)	- EI Companies: 1,2 - Governments: 1,2,8 - Development cooperation: 1,2,3,4,10

Figure 2.29: SWOT analysis for consumption linkages



Source: Authors

CONSTRAINTS ON LINKAGE POLICIES

3

This chapter focuses on constraints on linkage policies. These can be either domestic (internal) or related to international liberalization and globalisation (external). Domestic constraints have been discussed in the previous chapters, summarized in the weaknesses of the SWOT analyses, and are also addressed in the recommendations in Chapter 4. Especially the lack of an educated and skilled labour force, underdeveloped infrastructure and a limited access to finance are key domestic constraints. Institutional weaknesses related to the assessment and planning of linkages as well as to the monitoring and enforcing of agreements and regulations further hamper the development of linkages. Short political cycles and rent-seeking behaviour associated with the exploitation of natural resources can partly be attributed to the lack of effective policies.⁶⁴

With this in mind, this chapter will focus on external constraints. Indeed promoting industrial development today is not the same task as when developed countries embraced their industrial development a few decades ago. Liberalization through international legal frameworks such as the World Trade Organization (WTO) agreements, globalization and the slow but sustained race to automation in the EI sector present unprecedented challenges for developing countries today. These three phenomena have an impact on the scope of linkages that can be reasonably targeted by resource-rich countries.

3.1 International Legal Frameworks

International law places some restrictions on the tools governments can use in order to encourage the development of linkages between EI investments and the domestic economy. These rules are enshrined in several WTO agreements and numerous bilateral and multilateral trade and investment treaties.

⁶⁴ Jesse (2012) speaks about the 'dual nature' of local content alluding to its role in both fostering development and as a mechanism of elite accumulation and rent-seeking.

The key message is that over the past 20 years, these rules have both proliferated and become more stringent, creating a legal framework which governs countries seeking to develop these linkages now very differently than before the mid-1990s. These developments in international law can have significant implications for governments' ability to adopt local content policies in domestic laws, regulations, and investor-state contracts. Because international law sits above domestic law in the general hierarchy of legal rules, governments adopting local content measures that conflict with WTO law or the rules set forth in international investment treaties may have to abandon those local content measures and/or pay compensation to companies subject to those local content rules.

This section highlights these issues.

3.1.1 WTO Rules

When the WTO came into being in 1995, three new international agreements entered into force that set out certain rules relevant for linkage policies. One is the Agreement on Trade-Related Investment Measures (TRIMs Agreement); the second is the Agreement on Subsidies and Countervailing Measures (the SCM Agreement); and the third is the General Agreement on Trade in Services (GATS). In brief, these three agreements prevent various measures that had been used by countries (with varying degrees of success) to promote linkages. Table 3.1 illustrates the relevant measures, the WTO agreements restricting its use, and the linkage policies that may be affected.

Table 3.1: Overview of WTO measures and impacts on linkage policies

RESTRICTED MEASURE	WTO AGREEMENT	EXAMPLES OF LINKAGES POLICY AFFECTED
Measures that require or favour the use of domestic over foreign goods	TRIMs Agreement	Prevents governments from requiring mining companies to source goods from local providers; countries may also not condition incentives such as tax benefits on requirements to use local goods
Measures that impose quantitative restrictions on exports	TRIMs Agreement	Prevents governments from restricting exports of raw materials in order to encourage or require downstream processing or beneficiation
Measures that grant subsidies to domestic companies but make those subsidies contingent on sourcing inputs of goods from local producers	SCM Agreement	Prevents governments from encouraging EI firms to source goods from domestic firms by prohibiting governments from providing fiscal, financial, or other benefits to companies based on their use of domestic products
Measures that provide subsidies, tax breaks, or other preferential treatment to domestically owned and/or domestically established service providers but do not provide those same benefits to foreign-owned and/or foreign-established service providers	GATS ⁶⁵	Prevents governments from providing benefits to locally owned and/or locally established upstream or downstream service suppliers in order to help improve their competitiveness and ability to serve EI firms (unless those benefits are similarly provided to foreign-owned and/or -established services firms)
Measures that limit the participation of foreign capital in a services provider	GATS ⁶⁶	Prevents governments from requiring a certain amount of domestic equity in EI firms, a tool that may be employed in order to help promote technology transfer to domestic individuals or entities
Measures that require foreign investors in services to invest through certain types of legal entities	GATS ⁶⁷	Prevents governments from requiring that foreign companies investing in the EI form joint ventures with local partners or establish local corporations

While these restrictions are significant and – according to at least some countries – too stringent, they are weaker in a number of respects than the restrictions emerging from international investment treaties. The next section briefly discusses those agreements and their implications for linkage policies. For an expanded discussion on WTO agreements please refer to Annex 2.

3.1.2 Investment Treaties

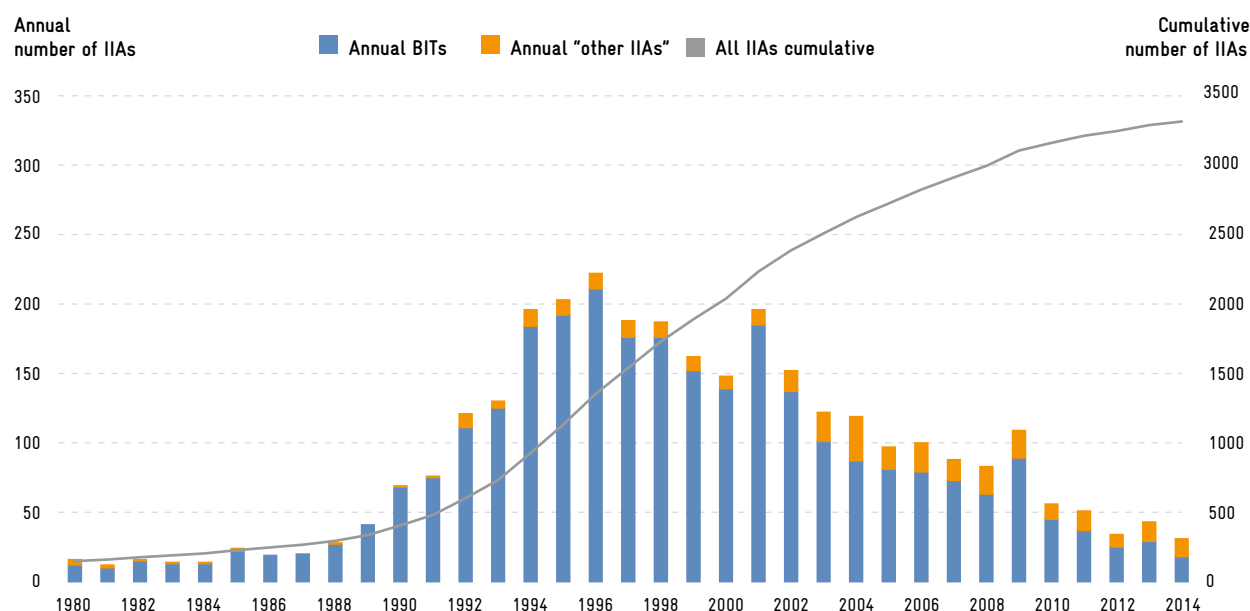
There are presently roughly 3,000 investment treaties concluded by countries all around the world, which contain rules regarding government treatment of foreign investors and their investments. These treaties, often referred to as “international investment agreements” or “IIAs”, include bilateral investment treaties (BITs), and bilateral or multilateral free trade agreements with investment chapters. While the pace of negotiating these treaties has slowed over the past 15 years from a peak during the 1990s, data indicate that the treaties are still being concluded at the notable pace of roughly one every two weeks.

⁶⁵ These GATS national treatment obligations only apply if and to the extent a country has committed to liberalize the relevant services sector

⁶⁶ These GATS market access obligations only apply if and to the extent a country has committed to liberalize the relevant services sector

⁶⁷ These GATS market access obligations only apply if and to the extent a country has committed to liberalize the relevant services sector

Figure 3.1: Annual and cumulative number of IIAs concluded



Source: UNCTAD (2015), World Investment Report 2015: Reforming International Investment Governance ⁶⁸

There are three key ways how these treaties can prevent countries from implementing linkage policies, namely, (i) national treatment provisions, (ii) specific restrictions on “performance requirements”, and (iii) obligations preventing states from interfering with foreign investors’ “expectations” for their operations (e.g. the “fair and equitable treatment” obligation). Whereas the national treatment provisions are common throughout the thousands of treaties that exist, restrictions on “performance requirements” are less common but impose much stronger restrictions on the use of industrial policy tools.

1. National Treatment

The national treatment requirement in investment treaties prevents governments from treating foreign-owned investments differently than domestically owned investments. This means that it can prevent governments from adopting any policies that aim to increase the competitiveness of locally owned goods and services providers, or to encourage the use of goods or services produced by locally owned companies, if those measures result in less favourable treatment of foreign-owned companies.

In the majority of investment treaties, these obligations only apply “post-establishment”, meaning that governments are free to treat foreign investors differently than domestic investors with respect to whether and how they can enter the domestic market. Nevertheless, a growing number of treaties also include “pre-establishment” protections, meaning that foreign investors have the right to enter and establish operations in the “host” country, and to do so under the same conditions and terms as domestic investors. This thereby frees those foreign investors from special conditions such as domestic equity requirements or requirements to form contractual joint ventures with local companies.

While the post-establishment national treatment obligation in investment treaties is similar to the national treatment provision in the GATS, and the pre-establishment national treatment obligation is similar to the GATS’ market access rule, there are two important differences between those investment treaty provisions and the GATS:

First, while the GATS is a “positive list” agreement, investment treaties are typically “negative list” agreements, meaning that they apply to all investments in all sectors unless governments have specifically indicated otherwise. Thus, the scope of the commitments under investment treaties is, as a rule, considerably broader than under the GATS.

⁶⁸ From World Investment Report 2015: Reforming International Investment Governance, by UNCTAD, © 2015 United Nations. Reprinted with the permission of the United Nations.

Second, while the GATS is enforced through a state-to-state mechanism under the WTO's rules of dispute settlement, investment treaties usually provide for investor-state arbitration. Under the WTO's state-to-state system, many measures may go unchallenged. This may be mainly because the consequences of the breach for the country are not severe enough to warrant the time, expense, or political cost of litigation or because the state that might complain also adopted offending measures and does not want to face similar WTO claims. In contrast, investors do not necessarily face the same disincentives to threaten or file actions under investment treaties alleging that the national treatment obligation has been violated.

2. Restrictions on Performance Requirements

The second way how investment treaties limit efforts to develop and strengthen linkages is through their express restrictions on “performance requirements”. As used in IIAs and described further below, “performance requirements” can include a wide range of mandatory and incentive-based measures, including measures requiring or encouraging the use of local providers of goods and services or the conduct of R&D in the host country. As noted above, most treaties do not include these types of provisions; nevertheless, the obligations, when included, are often “multi-lateralized”, and tend to be exceptionally strong.

Multilateralisation

While investment treaties are usually bilateral, provisions restricting the use of performance requirements often state that each country party to the treaty is barred from imposing performance requirements on investors from any country, not just investors from the other country party to the treaty.

Scope of prohibitions

Investment treaties often bar a range of performance requirements, including those

- Requiring investors to export a given level or percentage of a good or service;
- Requiring investors to favour the use of local goods and service suppliers;
- Requiring or incentivizing foreign investors to achieve a certain amount of domestic content (through expenditures on local labour, service providers, and goods providers); and
- Requiring the transfer of technology.

While some of these measures would already be prohibited under the WTO agreements, investment treaties commonly go beyond WTO prohibitions.

In addition to prohibiting governments from *adopting* measures that require or incentivize compliance with performance requirements, treaties also often prevent governments from enforcing prohibited performance requirements. One interpretation of this prohibition on “enforcement” of performance requirements is that, if a government enters into a contract with a foreign investor in which the investor agrees to achieve domestic content or other similar targets, the government cannot take any steps to *enforce* those contractual commitments.

Investors have used these treaty obligations to challenge a number of performance requirements imposed by states, including taxes imposed on producers of goods that sourced raw materials from abroad rather than from domestic producers,⁶⁹ and requirements on oil companies to make local expenditures on education and training and R&D (See box 3.1).⁷⁰

The **Mobil vs. Canada** case study shows that EI companies have already sued countries successfully under multilateral investment treaties for R&D and E&T provisions. The provision at issue in this dispute – which prevents governments from imposing or enforcing commitments to purchase, use, or accord a preference to local service providers – can be found in a growing number of IIAs. This highlights the importance of assessing with care what investment treaties entail (see recommendations G10, D2).

69 Archer Daniels Midland Company and Tate & Lyle Ingredients Americas, Inc. v. Mexico, ICSID Case No. ARB(AF)/04/05, Award, November 21, 2007; Cargill v. Mexico, ICSID Case No. ARB(AF)/05/2, Award, September 18, 2009; but see Corn Products International, Inc. v. Mexico, ICSID Case No. ARB(AF)/04/01, Award, January 15, 2008 (finding no violation of the performance requirements provision because, inter alia, it was not directly imposed on the claimant, but on the purchaser of the claimant's goods).

70 Mobil v. Canada, ICSID Case No. ARB(AF)/07/4, Decision on Liability and Principles of Quantum, May 22, 2012.

Box 3.1: Mobil vs. Canada: IIA dispute challenging use of “performance requirements”

In 1979, oil was discovered off the coast of Newfoundland (NL), Canada. At the time, unemployment in NL was 15%, nearly twice the national rate, and GDP was roughly half the national average. With the discovery of oil, the *“Government of NL quickly recognized that the resource could be used to promote the sustainable development of NL, but only if it was used properly. The Government realized that any development resulting from the oil would only be sustainable if the oil was used to develop skills and expertise in NL.”*⁷¹ The Government of NL and the federal government thus adopted legislation requiring, among other things, any petroleum operator looking to be licensed for activities in the area to submit and secure approval of a Development Plan laying out how an oil field would be developed and a Benefits Plan explaining how NL and Canada would benefit from the project. In one component of the Benefits Plan, the company had to set forth its plans for conducting R&D and education and training (E&T) in the area.

The claimants, two US companies, each indirectly owned minority shareholdings in two offshore oilfields in NL that were governed by Development and Benefits Plans. In 2007, the companies filed a case against Canada under an IIA, the North American Free Trade Agreement, arguing that the requirements to conduct R&D and E&T in Canada violated the IIA’s restrictions on performance requirements. More specifically, the companies argued that the measures violated the treaty’s provision prohibiting states from *“impos[ing] or enforc[ing] ... requirements ... to purchase, use or accord a preference to goods produced or services provided in its territory, or to purchase goods or services from persons in its territory.”* (NAFTA, Art. 1106(1)(c)).

The tribunal of three arbitrators appointed to decide this dispute agreed with the claimants. The arbitrators concluded that R&D and E&T are “services”, and that requirements to make local expenditures on those services constituted requirements to purchase or use services in the host country in violation of the NAFTA. The tribunal subsequently ordered Canada to pay CDN\$ 17 million to the companies as compensation for the unlawful performance requirements.⁷²

70 Mobil v. Canada, ICSID Case No. ARB(AF)/07/4, Canada’s Counter-Memorial, December 1, 2009, para. 14.

71 Mobil v. Canada, ICSID Case No. ARB(AF)/07/4, Award, February 20, 2015.

3. Substantive Treatment Standards

The third key way how investment treaties can limit the use of linkage policies is through substantive standards of treatment on expropriation and “fair and equitable treatment”. In one relatively well-known dispute, several Italian nationals used investment treaties to sue South Africa, challenging aspects of its Black Economic Empowerment (BEE) mining policy. The investors asserted that the BEE’s requirement that mining companies sell 26% of their shares to Black or Historically Disadvantaged Individuals at market prices constituted an unlawful expropriation of the investors’ property and violated the fair and equitable (FET) obligation. The proceedings were discontinued before the tribunal reached any decision on the merits of the investors’ claims.⁷³

In another dispute, mining companies initiated a dispute against Indonesia under the investment treaty signed between Indonesia and the Netherlands. The investors challenged various government measures aimed at increasing the domestic processing of copper, including new export conditions, a new export duty, and a 2017 ban on the export of copper concentrate. The dispute was discontinued shortly after it had been initiated.⁷⁴

The line between, on the one hand, a legitimate regulatory act (that has a negative impact on an investor) and, on the other, an expropriation or violation of the FET obligation, can be difficult to draw, not least because of the varying interpretations tribunals, states, investors, and other commentators have given to those provisions. Consequently, it may be difficult for a state to know in advance whether a given measure will prompt a treaty claim and, if so, whether that claim will succeed.

4. Exceptions

Some treaties contain exceptions that can enable states to maintain and even adopt new measures aimed at the development of linkages, even though those linkages would otherwise be inconsistent with the treaty.

73 Piero Foresti et al. v. South Africa, ICSID Case No. ARB(AF)/07/1, Award, August 4, 2010.

74 See, e.g., PT Newmont Nusa Tenggara, Press Release: Arbitration Filed Over Export Restrictions in Indonesia (July 1, 2014); Nusa Tenggara Partnership B.V. and PT Newmont Nusa Tenggara v. Indonesia, ICSID Case No. ARB/14/15, Order of the Secretary-General Taking Note of the Discontinuance of the Proceedings, August 29, 2014.

States might exempt a

- particular sector (e.g., mining, oil & gas),
- policy aim (e.g., aiding the development of historically disadvantaged groups),
- government domain (e.g., taxation),
- level of government (e.g., local government),
- type of measure (e.g., subsidy), or
- actual measure (e.g., rule requiring local processing of raw materials)

from all or some of the treaty’s substantive obligations.

Usually, these exceptions restrict the treaties’ articles on national treatment and restrictions on performance requirements. It is much rarer for states to include such exemptions from the obligations relating to expropriation and FET.

States might also or instead exempt matters from their treaties’ investor-state dispute settlement provisions, and subject certain claims to special rules of adjudication, including a mechanism whereby the state parties to the treaty can agree to block an investor’s arbitration claim.

Table 3.2: Restrictions on local content measures under international investment treaties

RESTRICTIONS	<p>Depending on the treaty, investment treaties can e.g. prevent:</p> <ul style="list-style-type: none"> Measures barred by the TRIMs Agreement Measures that require or incentivize foreign investors to make expenditures on domestic goods, services, and labour Requirements to establish a joint venture with domestic entities or to have a certain amount of domestic equity Requirements to locate headquarters in a specific region Requirements to transfer technology, production processes or other proprietary knowledge to individuals or entities in the host country Requirements to invest in R&D Measures (e.g., subsidies) that are only provided to or that otherwise treat locally-owned enterprises more favourably than foreign-owned enterprises Measures that have negative impacts on the operations or profitability of investments such that they constitute an expropriation or violation of FET
DISPUTE SETTLEMENT	Investor-State

3.1.3 Lessons Learned

Governments need to ensure policy coherence when signing investment treaties. For governments wishing to have the broadest set of tools possible to foster linkages, it is important to ensure that these treaties do not prohibit the adoption of measures desired by the state. This is particularly the case in light of both the growing number of IIAs going well beyond WTO agreements in terms of the types of domestic

policies they bar and the investor-state dispute settlement mechanism embedded in IIAs, which makes it relatively easy for companies to challenge and seek compensation for government measures that violate treaty provisions. Options for governments to consider include not concluding IIAs, narrowing the substantive obligations by, for example, excluding restrictions on performance requirements, and including exceptions for particular sectors, activities, or policy goals.

3.2 Changing production processes

3.2.1 Fragmentation of the global value chain
“The growing importance of global value chains in the production process is today at the heart of the world’s economic system” (Ramdoo, 2013). Production processes are increasingly fragmented as the organization of global value chains leads countries to be more and more specialized in specific tasks and business activities (rather than in specific goods and services) (Ramdoo, 2013).⁷⁵

The EI sector is a latecomer to adopting these fragmented production processes. However, the past decade has seen a transformation of the mining sector with a combination of heightened commodity price volatility and increased competition from emerging market players, driving the necessity to lower costs and focus on core activities. In the 1990s, the downturn in oil prices had also led to a similar restructuring of the oil and gas industry. Global EI companies have now put in place leaner supply chain management, which implies the outsourcing of non-core activities to low-cost suppliers subject to high and demanding standards. While the number of these suppliers decreased within the last years, the remaining ones hence grew in size. (Ramdoo, 2015)

Furthermore, higher value added functions concentrate in the global centres situated at the technological frontier, whereas lower value added activities are performed in countries with inexpensive low skill labour. Thus, if EI multinationals outsource more non-core competencies to suppliers in Africa (Morris et al., 2012), they tend to do so for low value added functions.

Due to the fragmented production processes, EI companies are in a stronger position to 1) decide which functions will be located in which countries, 2) set the standards to be met by supplier companies in order to stay in the value chain, and 3) manage suppliers that meet the standards. Some developing countries will benefit from this pattern and others will not: the former will get assistance from companies to upgrade their capabilities and participate in the global value chain, while the latter that do not meet the requirements to receive this assistance will remain excluded (UNECA, 2013).

Developing countries stay excluded from global value chains if they fail to provide the specialized inputs increasingly demanded by EI companies. This increased specialization can increase barriers to entry for “less efficient and specialized countries” (Hansen 2014) and diminishes the scope for upstream linkages.

Some analysis of GVCs has shown that the extent and depth of countries’ participation in GVCs is positively correlated with income, growth, and development, but GVC participation has been happening differently from one country to another. For roughly 65% of countries, their increased participation in GVCs over the past 20 years has led to a reduction in the share of domestic value-added in their exports. However, thanks to their increased participation in GVCs, countries’ export growth significantly overcompensated the decline in the share of domestic value-added in exports, causing greater participation in GVCs to overall increase GDP. Another 15% of countries (mostly in East Asia) increased the share of domestic value-added in their exports, often after initially experiencing rapid surges in GVC participation, mostly by upgrading within and across GVCs. Nevertheless, the remaining 20% of countries have neither seen improvements in GVC participation nor in the share of domestic value added in their exports, with the former occurring either because their participation first increased and then dropped below the starting point or because it stayed at a low level or dropped (UNCTAD 2013, p. 171). Figure 3.2 illustrates those different paths of GVC upgrading.

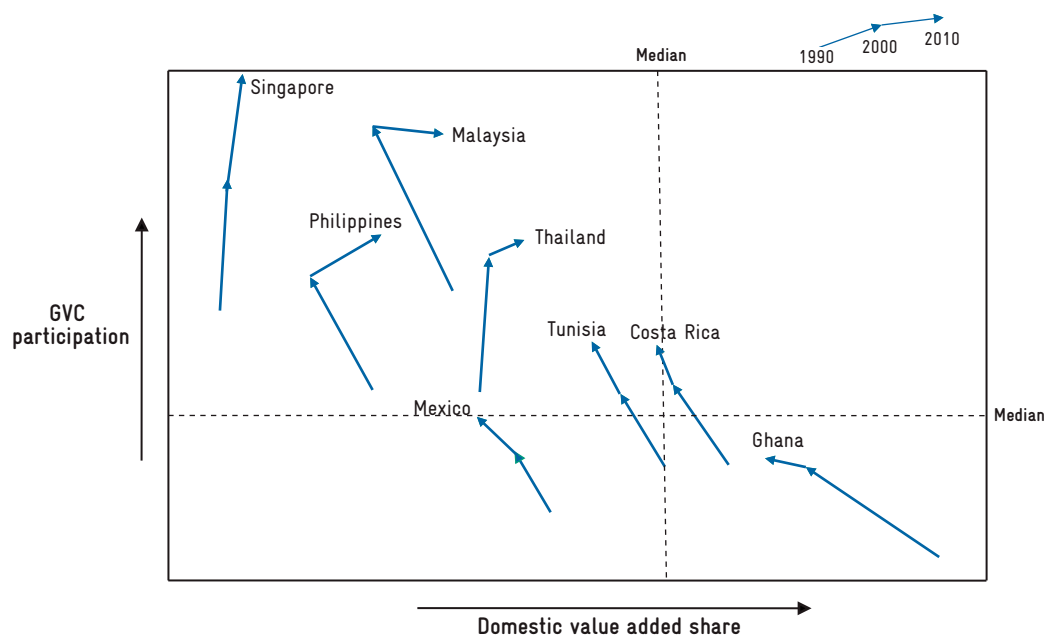
For most resource-rich developing countries, GVC participation “stems from upstream participation, presumably from exports of natural resources and raw materials.” (Bruhn 2015). However, “low growth in downstream participation” (Bruhn 2015) is avoidable, as the examples of Thailand, Malaysia and the Philippines show in the figure above.

Greater and deeper integration in the GVCs could start at the regional level as regional integration leads to higher integration in GVCs. Countries within the East African Community,⁷⁶ the most integrated trade block in Africa, have a higher participation in GVCs than their neighbouring countries and other regional economic communities on the continent (Ramdoo, 2015). It is also consistent with the finding highlighted in Chapter 2 that regional integration helps expand the impact of linkage policies and makes market-driven linkages more viable (see recommendation G9).

⁷⁵ According to WEF (2012), intermediate inputs constitute more than half of imports in OECD countries and nearly 75% of imports in countries like China and Brazil.

⁷⁶ The EAC’s member countries include Burundi, Kenya, Rwanda, South Sudan, Tanzania, and Uganda.

Figure 3.2: GVC Development Path by Country



Source: UNCTAD (2013), World Investment Report 2013: Global Value Chains: Investment and Trade for Development ⁷⁷

In turn, spatial linkages from the EI sector can be a catalyst for regional integration (Toledano, 2015; World Bank, 2015) if the EI project and export point are located in different countries. EI companies are powerful and influential players with profit maximization objectives that will favor the most direct route to export their commodities in order to minimize capital and operational expenditures. The most direct route may require crossing borders. EI companies will insist on competitive transport pricing and timely delivery, which will require neighboring countries to cooperate and agree on cross-border arrangements. Improvements for the EI project are also likely to improve cross-border hard and soft infrastructure for other sectors. Such resource corridor collaboration can catalyze further regional integration.

The malign side of GVCs

“Globalization thus has two faces: a benign side accelerating the participation of developing countries into the world economy with positive impacts on industrialization and income levels, and a malign side increasing inequality and leading to major stress on workers and the environment.” (Milanovic, 2003)

⁷⁷ From World Investment Report 2013: Global Value Chains: Investment and Trade for Development by UNCTAD, © 2013. United Nations. Reprinted with the permission of the United Nations.

As Milanovic alludes to, GVCs can also worsen the conditions of workers and suppliers, and increase inequality between and within countries. To mitigate those risks, EI companies should at the very least conduct human rights due diligence to “identify, address and mitigate adverse human rights impacts” with which they may be implicated – either directly or indirectly through their transactions with contractors and suppliers (Shift, 2012). In the context of GVCs, doing so may not be feasible, especially as there may be hundreds, if not thousands of supply chain relationships that an EI company would need to investigate. Therefore, EI companies often need to prioritize those upstream business relationships for which it is most critical to conduct human rights due diligence. EI Companies can address this very briefly by mapping out their supply chains, focusing on business relations in their supply chains above a certain threshold, obtaining these relations’ buy-in in the mapping process, and then working with those entities to address and mitigate human rights grievances (Shift, 2012).

3.2.2 Automation

There is an increasing trend in the EI sector to move towards automation. This will increase productivity and improve the health and safety record of the industry, but, at the same time, it will further reduce the number of people employed in the sector and alter procurement requirements.

Recent decades have seen substantial process innovation in the EI sector (such as larger, more durable and efficient shovels, haul trucks, crushers, grinding mills, flotation cells, and better chemistry to improve processing recoveries). In the nearby future, the EI industry will likely experience an

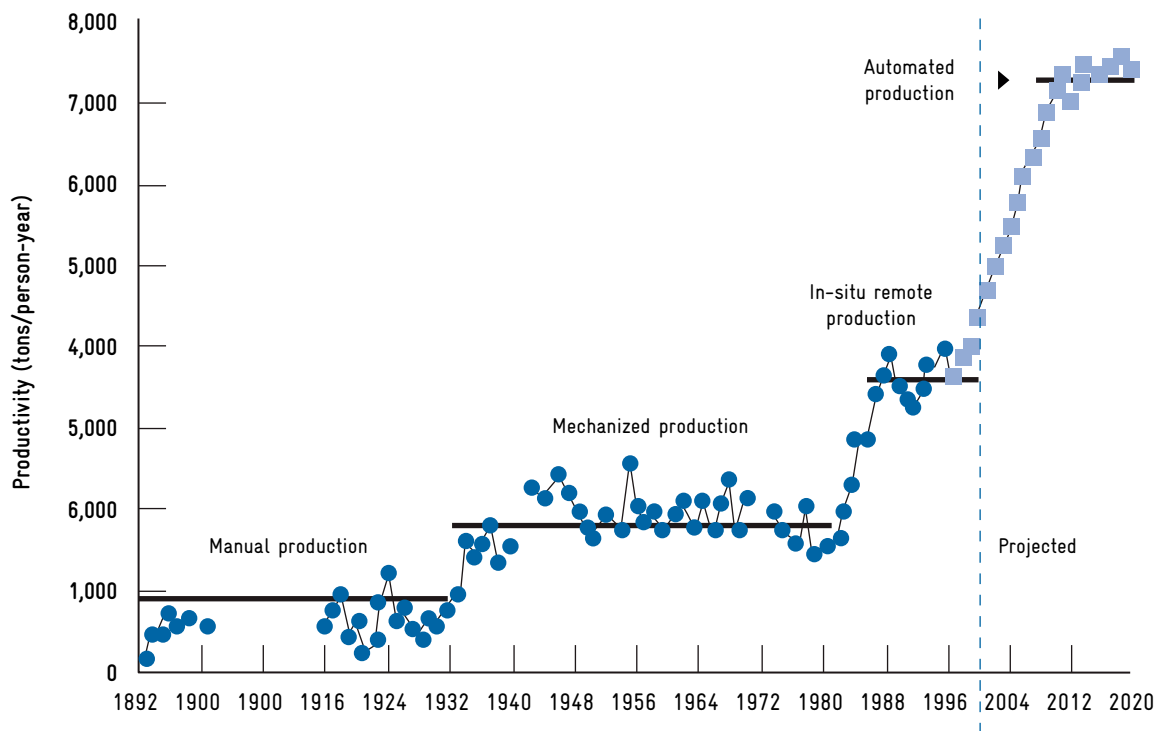
unprecedented transformation with regard to automation’s scale and distribution, especially during the next decade (see figure below). Australia is today at the forefront of this evolution (see Box 3-2).

Box 3 2: Automation is already happening

Rio Tinto’s Pilbara mine in West Australia is the epitome of the mine of the future. In April 2013, Rio Tinto announced that the project had moved more than 100 million tons of earth since automating their trucks fabricated by Komatsu Ltd.⁷⁸ Rio Tinto has also designed a fully automated train network for its mine. The project is estimated to cost \$518M USD and will be the world’s first automated long-distance heavy-haul rail operation.⁷⁹ Similarly, BHP Billiton has been working with Caterpillar since 2007 to produce autonomous driver technology at its Australian mines.⁸⁰

Beyond Australia, Sandvik, a mining supplier of equipment, has introduced an automated loading and hauling system for underground hard rock mining, called Sandvik Automine. It is currently in use at a Codelco Mine in Chile (since June 2004), a mine in Finland (since January 2005), a mine in South Africa (since August 2005) and a mine in Canada (June 2007). Atlas CopCo, another mining supplier of equipment, has also tested remote haulage zones with two fully automated trucks at Nordana’s Brunswick Ore Mine in Quebec, Canada (Horberry, 2012).

Figure 3.3: The shifting nature of value chain integration



Source: Peterson et al. (2001), *New Forces at Work in Mining: Industry Views of Critical Technologies*

78 http://www.riotinto.com/media/media-releases-237_8441.aspx

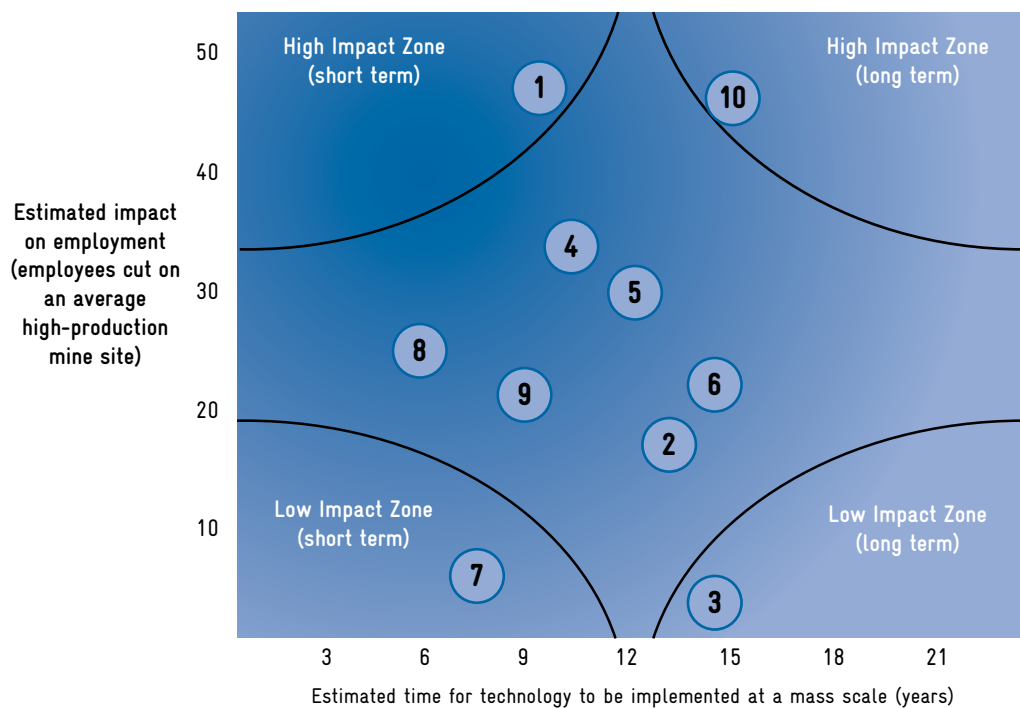
79 Rio Tinto pushes ahead with driverless trains in Pilbara, Sydney Morning Herald, March 10, 2015 <http://www.smh.com.au/business/mining-and-resources/rio-tinto-pushes-ahead-with-driverless-trains-in-pilbara-20150309-13z28v.html>

80 Top Driverless Trucks in the Mining Industry Today Plus Future Concepts, Mining Global <http://www.miningglobal.com/machinery/947/Top-Driverless-Trucks-in-the-Mining-Industry-Today>

Automation will probably decrease the number of low to semi-skilled operational jobs (drilling, blasting, train and truck driving) and create new jobs in the development, observation, servicing and maintenance of autonomous and remotely controlled equipment. Other traditional jobs such as site rehabilitation, road building and other site works are likely to remain.

Figure 3.4 shows the employment impact of the diffusion of different technologies by plotting the estimated duration of a technology's diffusion (x-axis) against the number of displaced employees at a representative high-production mining site (y-axis).

Figure 3.4: Employment impact of different technologies implemented over time



Source: Peterson et al. (2001), *New Forces at Work in Mining: Industry Views of Critical Technologies*

Caption:

1. Autonomous Haul Trucks and Loaders
2. Autonomous Long Distance Haul-Trains
3. Tele-remote Ship-Loaders
4. Semi-autonomous Crushers/Shovel Swings/Rock Breakers
5. Automated Drilling Systems
6. Automated Dragline/Long-wall Plough and Shearers/Earth Moving Systems
7. Geographic Information Systems and GPS
8. Autonomous Equipment Monitoring
9. Programmable Logic Controllers
10. Control Systems

Along with automation's impact on direct employment, which in turn will have an impact on consumption linkages, procurement will also be affected. Given that in-pit mine staff is likely going to decrease, the demand for catering, protective gear, and other goods and services used by in-pit mining staff will also decrease. These items are often the "low hanging fruits" which can be sourced locally even in countries with a less developed supplier base, as they do not require high-skilled inputs. Other upstream services such as mining and drilling, transport and logistics, analysis and testing will likely require higher technological content. This in turn will increase the barriers to entry for suppliers and will require government efforts to build NSIs to help suppliers adapt to these new technologies.

3.2.3 Lessons Learned

Globalisation and automation restrict the tools available to governments for the promotion of linkages between foreign investors and the domestic economy.

Host governments have limited control over globalisation and automation of the EI sector, two processes run by market forces. Resource-rich countries that do not adopt a forward-looking policy centred on education, skills training, and technology development incur the risk of being excluded from global value chains and suffering from drastic job losses in an automated world. This also speaks to the need for governments to improve their "capacity to embrace policy shifts" (Ramdoo, 2015) as the economic situation of their countries evolves in response to globalization. To develop linkages, governments need to adopt forward-looking policies in line with changing circumstances.

4



RECOMMENDATIONS BY STAKEHOLDER

This section provides recommendations on how EI companies (“E”), governments (“G”) and development cooperation (“D”) can contribute to the creation of linkages to the EI sector. The linkage type that each recommenda-

tion addresses most directly is listed in brackets.⁸¹ The figure below summarizes the recommendations to stakeholders by linkage type.

Figure 4.1: Relevant recommendations by linkage type and stakeholder

UPSTREAM	<ul style="list-style-type: none"> - EI Companies: 1,2,3,4,6,7,8,9,10 - Governments: 1,2,3,4,5,6,8,9,10 - Int. development cooperation: 1,2,3,4,5,6,7,8,9,10
DOWNSTREAM	<ul style="list-style-type: none"> - EI Companies: 2,5 - Governments: 1,2,4,8,9,10 - Int. development cooperation: 1,2,3,4,5,8,10
HORIZONTAL	<ul style="list-style-type: none"> - EI Companies: 7,8 - Governments: 1,2,4,5 - Int. development cooperation: 1,2,4,7,8,10
KNOWLEDGE	<ul style="list-style-type: none"> - EI Companies: 1,2,3,4,7,8 - Governments: 1,2,3,4,5,6,8,9,10 - Int. development cooperation: 1,2,3,4,5,6,7,8,10
SPATIAL	<ul style="list-style-type: none"> - EI Companies: 1,2 - Governments: 1,2,7,8,9 - Int. development cooperation: 1,2,3,5,10
CONSUMPTION	<ul style="list-style-type: none"> - EI Companies: 1,2 - Governments: 1,2,8 - Int. development cooperation: 1,2,3,4,10

Source: Authors

⁸¹ It is difficult to draw a line as to when a linkage type is directly or only indirectly affected by a recommendation. Efforts were made to be consistent in this somewhat subjective selection process.

4.1 Extractive industry companies

Recommendation E1

Instil the importance of linkage creation in the corporate identity to ensure a common understanding and goal of the employees within an EI company to be embedded in the countries of operation. A corporate vision and a team championing linkages can support this. More importantly, though, such considerations should be taken into account by operational departments. Therefore, in-house trainings on linkage opportunities should be given throughout the company at various management levels and in-country offices. These trainings should explain what the EI company's responsibility to respect human rights means in the context of linkages and GVCs. An early social impact assessment prior to the start of operations, bringing up baseline information on local economic conditions, would help embed the need for linkages in the corporate mindset while also accommodating the planning needs related to the development of consumption linkages in particular. A cross-departmental linkage committee integrating the key business functions could be created to achieve a buy-in across the whole company.⁸²

[Upstream, knowledge and technology, spatial, consumption linkages]

Recommendation E2

Liaise with relevant government agencies prior to making investment decisions to understand the priorities and assess opportunities for linkage creation. Within the government, the agencies responsible for education, industry, and infrastructure are of strategic importance. Existing national development strategies should be reviewed and companies' actions should be adapted to fit them. Utility providers (water, power and telecommunications) should also be consulted to explore potential synergies with EI-related infrastructure. While not related to the core business of EI companies, support for agriculture programmes as in Mozambique can be critical to save companies' social license to operate and in turn facilitate the creation of consumption linkages.

[Upstream, downstream, spatial, knowledge and technology, consumption, linkages]

Recommendation E3

Coordinate among EI companies before making investment decisions in order to explore synergies and opportunities for linkage creation. EI companies operating and desiring to operate in the region should be contacted. Capital

expenditure can be reduced significantly through economies of scale if infrastructure investments in power plants and transmission lines, water facilities, railways, pipelines, and ports are shared among EI companies. Standardizing policies, such as the prequalification criteria for suppliers, can reduce the tendering costs of SMEs. EI activities may be coordinated through the respective chamber of mines or chamber of oil & gas. The creation of such chambers or alternative coordination mechanisms should be considered, if they do not already exist.

[Upstream, knowledge and technology, spatial linkages]

Recommendation E4

Manage expectations regarding the impact of linkages on the domestic economy to avoid disappointments on the side of the government or at the national, local, and community levels. This is especially important in countries and regions not experienced in resource extraction, since the industry is not yet well understood and the domestic skills needed to create linkages do not exist. Rather than providing total procurement opportunities or employment figures, companies should provide a breakdown of the number of national, provincial and local opportunities along the project life phases. Public awareness campaigns explaining how the sector works and what impacts the project may have on the day-to-day life of citizens, including those not directly or indirectly employed by EI companies, should also be rolled out. Communication strategies should also help manage suppliers' expectations in order to avoid overcapacity without outlet.⁸³

[Upstream, knowledge and technology linkages]

Recommendation E5

Provide governments with pre-feasibility studies on downstream processing projects to assess whether such projects are economically feasible. Vertically integrated EI companies, such as Shell in the petroleum sector and ArcelorMittal in the iron and steel sector can explore the possibilities to setup downstream industries themselves. Non-vertically integrated companies can assist the government in preparing pre-feasibility studies and reach out to the businesses specialized in downstream processing that will assess whether the investment is commercially feasible.⁸⁴

[Downstream linkages]

⁸³ In Madagascar such overcapacity occurred, as the mining company supported farmers, set up a training center, and enhanced their productivity, but the company ended up not being able to buy all of the farmers' produce (Interview with GIZ South Africa, August 2015).

⁸⁴ In 2005 Companhia Vale do Rio Doce (today Vale) provided the Government of Mozambique with pre-feasibility studies for seven satellite projects that could be linked to the coal mining project (cement plant, coking coal plant, aluminium smelter, bio-fuel project, steel mill, ferro-alloy plant and charcoal project) the company was developing at the time. The Ministry of Industry and Trade then provided these studies to interested investors.

⁸² GIZ, Policy Note: Maximizing Local Content in Madagascar's Mining Sector, Lessons learned from Madagascar and abroad, September 2014

Recommendation E6

Prepare long-term procurement plans during the feasibility study of the project so that potential suppliers have sufficient time to prepare for tenders and support can be provided to satisfy the standards required by EI companies. This will require a needs assessment that defines the companies' demand for labour, capital goods, consumables, and services. A gap analysis, which assesses what is needed to increase local procurement in the medium- and long-term, should accompany this process. The figures in Annex 1 illustrate how opportunities can be assessed and how the procurement plan will need to reflect the various stages of the mining life cycle.

[Upstream linkages]

Recommendation E7

Support vocational training for both men and women to train them to become future employees and service providers of the EI companies, and to develop skills applicable in other sectors of the economy. In order to create a curricula tailored to the EI sector's needs, companies need to help identify the level of technological know-how required for the production of various capital goods, consumer goods, and services over the lifetime of the project. This should be part of an early assessment, which feeds into the procurement plan. During operations, training to suppliers should focus on increasing the quality standards required for technically more advanced tenders. Transferrable skills required by both the EI and other sectors in the economy include management skills (accounting, business planning, budgeting procedures, international standard requirements, etc.) and mechanical skills such as welding. Such skills will also be valuable to employees and suppliers once they no longer work for EI companies. To address women unemployment, specific training modules need to be designed to specifically address woman entrepreneurship needs.

[Upstream, horizontal, knowledge and technology linkages]

Recommendation E8

Create joint research projects with universities, like in Brazil and Norway, with the aim to specialize and improve the technology suited for the geology in the host country. Apart from potentially creating an environment that may lead to technological innovation, which in turn may reduce costs to EI companies, such projects have the potential to create knowledge spillovers and enhance the comparative advantage of the country.

[Upstream, horizontal, knowledge and technology linkages]

Recommendation E9

Adapt tenders to local realities, have woman employment as a bidding criterion, update local procurement plans, and impose local content requirements on international sub-contractors to ensure that domestic gender balanced procurement opportunities can be maximized. This may require using different communication channels such as local newspapers, online portals, radio announcements, events at the national and regional level, and announcements at town halls. It may also involve unbundling large tenders that require different levels of expertise. Furthermore, local procurement plans will need to be updated on a regular basis to reflect changing project needs and local market conditions. In addition, when the company outsources a lot of its operations to international subcontractors, the company could require or reward local content commitments of subcontractors when awarding tenders in order to foster linkages further up the value chain. In order to prevent adverse human rights impact in their business relationships, companies should communicate their human rights policy to their business partners and carry out human rights due diligence. Finally, to encourage woman participation in the supply chain, woman employment can be a criterion in bid for suppliers.

[Upstream linkages]

Recommendation E10

Provide financial assurances and support to local suppliers in order to help SMEs grow to a size at which access to finance is less problematic. This may be done by engaging with banks and sharing information about the project and supplier to reduce the perceived risk and thereby borrowing rates. Funds can be created that provide direct financing for domestic suppliers at beneficial rates. Forward purchasing agreements and advance instalments at the time of awarding the bid may help smaller enterprises, which do not have sufficient capital to purchase the required inputs, thereby lowering borrowing and production costs. Finally, equity partnerships with domestic suppliers may provide the required capital and reduce the risk perceived by banks, thereby lowering borrowing costs.

[Upstream linkages]

4.2 Governments

Recommendation G1

Prepare a long-term development strategy in order to guide policy coherence and achieve development goals and targets. In resource-rich countries, the EI sector should play an important role in economic development (see recommendation G3). Clear policies, laws and regulations should guide sustainable investments.⁸⁵ Import exemptions, for example, should be reviewed as they can be a roadblock if ill-designed, as in the case of Nigeria. Coordination among government agencies is crucial to implement such a strategy, given that linkage creation is a multi-disciplinary endeavour.

[All linkages]

Recommendation G2

Develop an industrial/diversification policy, which sets out how the country aims to develop economically. An important aspect of this policy should be improving the business environment by, for example, cutting red tape. The policy should also target sectors based on the competitive advantages the country has to offer, the objectives that the country wants to achieve (see recommendation G1), and the expected future developments in terms of demand and technological progress. The linkages to the EI sector should be part of the assessment needed to develop an industrial strategy in resource-rich countries.⁸⁶ Downstream linkages, however, should be analysed with care, given that the location advantage does not seem to be a major factor determining comparative advantage. The assessment should also take into account the future role that the country can hope to play in the global value chain and which impact the automation of processes in the extractive industry will have. The forecasted domestic demand (consumption linkages) resulting from increased economic activity in the zones where EI companies are or will be operating should also feature in the assessment. Special focus should be placed on sectors where domestic demand is going to increase most rapidly and where the location advantage is large; in countries with a low GDP per capita, these include mainly the agriculture and construction sectors.

⁸⁵ Experience shows that the lack of coherence and clarity is the biggest roadblock to linkage creation (Interview with GIZ, South Africa, August 2015).

⁸⁶ However, especially the downstream sector should not be treated significantly differently from other sectors in the economy; given that the location advantage of the resources does not seem to be a key determinant of countries' ability to move downstream competitively, cost-benefit analyses are needed. The government should be aware that the use of prescriptive methods aimed at fostering downstream integration may adversely affect the EI sector and reduce associated revenues in the short term (Interview with EI advisor, August 2015).

⁸⁷ Positive incentives, for example tax deductibility for training expenses, are thought to be more effective than sanctions (GIZ, Policy Note: Maximizing Local Content in Madagascar's Mining Sector, Lessons learned from Madagascar and abroad, September 2014).

⁸⁸ www.equip-project.org

The industrial diversification policy should be supported by the corresponding allocation of government resources as well as incentives and sanctions for the private sector in order to make it effective.⁸⁷ GIZ-UNIDO's EQuIP toolbox⁸⁸ can be used as a guide for this purpose. Economic zones with specialized infrastructure as well as targeted vocational training aimed at the identified sectors and linkages can support the strategy. The formation of clusters with industries that have synergies with the EI should be encouraged to increase the possibility of horizontal linkages. Support needs to be provided at the local government level to implement the strategy. Monitoring and evaluating the impact of these policies is key to determine when they should be adapted or abandoned.

[All linkages]

Recommendation G3

Develop a local content policy to provide EI companies with a framework in which to operate in. Focus should be placed on local value added rather than local ownership as Nigeria and Mexico have done.⁸⁹ The policy should be developed in close coordination with the EI sector, for example through public-private dialogues, to set the right targets.⁹⁰ The targets should be updated on a regular basis to reflect the development of the country and the resource sector. To ensure that the company complies with its local content commitments the government should set detailed and regular reporting requirements and define a clear process for approval.⁹¹ The local content policy should however consider that the realization of upstream linkages anchored on these local content targets is a shared responsibility between the public and private sector. Thus, the government should identify what investments are necessary to complement, facilitate, and maximize the private sector's intervention. The local content policy should also be forward looking and take into account the technological changes that the EI is undergoing.

[Upstream, knowledge and technology linkages]

⁸⁹ Local ownership can lead to the creation of trading companies, which do not create many employment opportunities or knowledge and technological spillovers since they often import the goods and services demanded by the EI sector instead of producing them locally.

⁹⁰ If the targets are too low, there is a missed opportunity for the domestic economy. If they are too ambitious, extractive companies will not accomplish them and rather pay penalties in place where they are in place.

⁹¹ CCSI offers a series of local content legal and policy profiles, which highlight sectors' reporting requirements (see: <http://ccsi.columbia.edu/work/projects/local-content-laws-contractual-provisions/>).

Recommendation G4

Strengthen the absorptive capacity of the local population. The lack of human capital in resource-rich countries is one of the key constraints to the creation of linkages to the EI sector. This issue affects all levels of education, including primary education. Governments and companies can only provide specialized trainings where there is a good educational base to build upon. Governments should also encourage vocational training by co-investing into relevant programmes and ensure that training curricula serve the needs of the EI and other sectors, as was done in South Africa. This issue especially affects women and girls, which is why their specific needs should be taken into account in the design of such programmes.

[Upstream, downstream, horizontal, knowledge and technology linkages]

Recommendation G5

Promote higher education and R&D programmes and include such components with clear targets and monitoring mechanisms in the local content policy (see recommendation G3) in order to increase the productivity of the country through higher skills and expertise. This will require a technological gap assessment measuring the existing technological know-how, what is required, and how new technological expertise can be developed. Intellectual property rights should be adapted to the existing level of technological know-how. Targets for EI companies could include a dollar value that the company needs to pay into an R&D fund as in Brazil⁹² and/or a number of scholarships that the EI will fund. Governments should also contribute financially to these R&D programmes on a matching grant basis – especially in countries where labour turnover is likely to be high and therefore incentives for the EI to provide higher education low. R&D programmes looking to create horizontal linkages are unlikely to be financed by EI companies. Therefore, governments should place a special focus on them.

[Upstream, horizontal, knowledge and technology linkages]

Recommendation G6

Create SME support mechanisms to help the EI sector meet its local content targets (see recommendation G3) and support women's economic participation. A local content policy will only be successful if the government also commits funds and resources to its achievement. The government should create enterprise maps that include all available goods and service providers in the country, as well as a brief due

92 In Brazil such a fund finances the National Petroleum Agency for Human Resources Programme, which includes higher level training for petroleum specific disciplines into the curriculum of research institutions and grants scholarships for studies in this area (UNCTAD, 2012).

diligence analysis on each local company's structure, management processes and technical and financial qualifications.⁹³ Financial support should be provided to SMEs as in Australia. Special attention should be paid to those SMEs that are not yet sufficiently qualified to win tenders of EI companies and therefore do not benefit from supplier programmes. Feedback from unsuccessful bids is crucial to improve performance and the government should liaise with the EI company in order to provide this feedback. In many countries, there is also a large geographical disparity in terms of expertise of SMEs. Governments can incentivize business association between SMEs located in the capital city and SMEs in rural areas, where EI projects are often located, in order to promote "local local content".⁹⁴ Furthermore, governments should leverage companies' and development partners' help to ensure women's organizations receive support in the form of trainings on business skills. Helping these organizations' capacity to support each other can lead to further empowerment and female entrepreneurship.

[Upstream, knowledge and technology linkages]

Recommendation G7

Create the legal framework to allow for shared-use infrastructure access and include existing and planned EI investments in the infrastructure planning process in order to ensure that the economies of scale and scope of private sector infrastructure investments foster the development of infrastructure linkages. However, sharing infrastructure can come at a cost to both the EI company and the country (in the form of lower tax receipts). Therefore, project-specific cost-benefit analyses are required rather than a blanket shared-use rule. There should however be a clear legal framework allowing the government to intervene into infrastructure projects if the intervention's benefits exceed its costs. For infrastructure investments covering long tracks of land (such as pipelines, transport, power infrastructure), governments should also always keep the 'right of way' in order to facilitate the construction of additional infrastructures at a lower cost as is done in Brazil. When trunk infrastructure is shared, the government will need to develop feeder infrastructure in order for surrounding regions to benefit from access. A regulatory entity responsible for arbitrating disputes is also necessary.⁹⁵

[Spatial linkages]

93 Positive experiences have been reported by programmes in Ethiopia, Ghana and Tanzania, which were supported by the International Growth Centre (<http://www.theigc.org>). The enterprise maps contain sector profiles, detailed supply chains, and in-depth information on major companies within each sector and on their sources of inputs. This information should be useful to both governments identifying potential areas for the promotion of upstream linkages and to potential suppliers (Africa Development Bank et al., 2013).

94 Interview with GIZ South Africa, August 2015.

95 For more specific recommendations, see: CCSI: "A Framework to Approach Shared-Use of Mining-Related Infrastructure" (March 2014), available at: http://ccsi.columbia.edu/files/2014/05/A-Framework-for-Shared-use_March-2014.pdf

Recommendation G8

Cooperate and coordinate with the EI sector when developing linkage plans to ensure that these are realistic and manageable. The EI companies are best placed to provide needs assessments and inputs regarding targets and timelines based on their experience in other countries. In particular, governments should require EI companies to carry out social impact assessments as a condition for obtaining a mining licence in order to ensure that EI companies collect baseline information on local economic conditions, which can then be used to properly assess and plan the creation of consumption linkages. If a state-owned company manages a country's extractive sector, consider partnering with EI companies in order to maximize knowledge and technology spillovers. The cooperation agreement should point out how this may be achieved.

[Upstream, downstream, spatial, knowledge and technology linkages, consumption linkages]

Recommendation G9

Consider regional markets when assessing the opportunities for linkages to benefit from regional cooperation, as larger markets are often necessary for the viability of linkages. Larger pools of resources make 'regional content' more attractive to investors,⁹⁶ especially when a significant operating scale is required for procured goods (such as chemicals and plastics). Regional procurement could count towards local content.⁹⁷ To support such policies, regional bodies could create regional supplier lists, help standardize the definition of local content and set standards.⁹⁸ High-capacity downstream projects, such as smelters, are more likely to be viable if viewed from a regional rather than national perspective.⁹⁹ Specialized regional training centres can also reduce costs for participating countries. Spatial infrastructure solutions should be considered at the regional level. Given that ore deposits cross national boundaries, there are opportunities for economies of scale in infrastructure investments.

[Upstream, downstream, spatial, knowledge and technology linkages]

96 Interview with corporate expert, August 2015.

97 Interview with advisor, August 2015.

98 Interview with corporate expert, August 2015.

99 There is only demand for a limited number of smelters and refineries on the African continent, for example. It is therefore unrealistic for each country having oil or mineral reserves to build refineries and smelters. Of course, it is politically difficult to decide where a refinery should be built.

Recommendation G10

Ensure that international commitments in new trade and investment agreements leave governments space to use policy tools that can help to create linkages. Many governments are already subject to WTO rules that restrict measures favouring the use of local goods. Governments should review their existing commitments to avoid being taken to court. Furthermore, new trade and investment agreements increasingly go beyond WTO restrictions and impose additional restraints on what measures may be taken to support local service providers, build up domestic capacity, and require domestic research and technology transfer.

[Upstream, downstream, knowledge and technology linkages]

4.3 International Development Cooperation

Recommendation D1

Support the government in addressing the institutional failures constraining linkage creation. These failures result from a lack of coordination both between the relevant ministries and government agencies and EI companies as well among the government bodies themselves.¹⁰⁰ Policy cohesion and coordinated actions in support of linkage creation are crucial in order to be successful. Development partners' experience with inter-ministerial coordination could be beneficial here. Furthermore, specific linkages would benefit from key institutions that are often missing. For instance, a strong independent regulatory authority making impartial decisions is required for the creation of spatial linkages. For the creation of upstream linkages, a dedicated agency in charge of planning for and implementing local content requirements is often seen as being effective. International development cooperation can play a key role in supporting the setup of such entities. Herein, German Development Cooperation may benefit from being widely perceived as a neutral agent and honest broker between governments and EI companies.

[All linkages]

Recommendation D2

Align policy advice and coordinate development assistance in order to provide coherent and consistent support to resource-rich countries. As with governments (see recommendations G1, D1), it is crucial for development partners

100 Morris, Kaplinsky, and Kaplan (2011) believe that the lack of coordination and misalignment within agencies and between the public and private stakeholders has been the key obstacle to creating linkages in Africa.

to develop a strategy determining which policies will be supported. Without an internal alignment, conflicting policy advice may be given. For example, as highlighted in section 2.5 and Chapter 3, advice on intellectual property rights and trade and investment treaties can be in direct conflict with advice given on local content or industrialisation policies. Advice on these topics is generally provided by different departments, which often have different views about the optimal level of government intervention.¹⁰¹ It is also important to liaise with other development partners advising in a particular resource-rich developing country to avoid duplication of efforts or conflicting programmes. Germany has a number of agencies that invest in, provide financial resources to, and advice to resource-rich countries on issues closely related to linkage creation.¹⁰² Coordination among these stakeholders is key to maximize the benefits of German Development Cooperation in creating linkages to the extractive sector.

[All linkages]

Recommendation D3

Provide project and infrastructure financing in order to make EI projects located in developing countries financially viable if they are too risky for commercial banks to invest initially. Apart from making financial support conditional on high social and environmental standards, financial development institutions should also review and support any associated investments that help to create linkages. Especially capital-intensive investments in infrastructure solutions and opportunities for spatial linkages should be assessed in detail. Apart from the trunk infrastructure, financial development institutions can also support the feeder infrastructure (see recommendations G7). In both of these areas, Germany can draw on the financing experience of the KfW banking group.

[Upstream, downstream, consumption, spatial, knowledge and technology linkages]

¹⁰¹ By the very nature of their training and experience, trade economists, for example, will be more likely to support policies geared towards less government intervention.

¹⁰² These agencies include the following: (i) GIZ, which (among else) provides technical advice on good governance, private sector development, and trade policy; (ii) the International Project and Export Finance Bank (KfW IPEX-bank), which invests in the development of oil, gas, mining, and infrastructure projects; (iii) the Deutsche Investitions- und Entwicklungsgesellschaft (KfW DEG), which supports German companies with their foreign investments and provides financing for SMEs in developing countries; (iv) the KfW Entwicklungsbank (KfW), which provides financing for developing country governments to build up financial systems and invest in energy and water infrastructure; (v) the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), which provides technical support to developing countries on matters related to geology and extractive resources; and (vi) the Physikalisch-Technische Bundesanstalt (PTB), which provides advice on intellectual property rights and helps companies in developing countries meet certification standards for export purposes.

Recommendation D4

Help develop industrial policies, given that the laissez-faire approach has not worked in creating linkages to the extractive sector. Industrial policy support is still very uncommon among international development cooperation (there are exceptions, as shown by the EQUiP Toolbox¹⁰³, which aims to support governments to develop evidence-based structural industrial policies). This is largely because the role of development partners in the 1980s and 1990s was often limited to privatizing state-owned EI and liberalizing investment and trade regimes to allow FDI to flow freely. Attracting investment was seen as an end rather than a means to an end, which should be sustainable economic development. This has led to a very suboptimal exploitation of linkage potential in the past.¹⁰⁴ Apart from focusing on general policy advice that may foster linkage creation such as the improvement of the business environment, international development cooperation should help countries assess what sectors may have a comparative advantage and what type of linkages to existing FDI projects could be developed. The analysis should include how national and local demand (in particular for local produce) will develop due to the economic activity related to the EI sector (as also discussed in recommendation G2) and, consequently, how development partners' intervention in support of small-scale agriculture would help maximize consumption linkages.

[Upstream, downstream, horizontal, consumption, knowledge and technology linkages]

Recommendation D5

Assess which private sector actors would benefit most from support initiatives in order to maximize the impact of development assistance. While the largest oil, gas and mining companies have the largest EI projects in their portfolio, which in turn may create large opportunities for linkages in absolute terms, these companies are also the most advanced in thinking about linkages and can draw on experiences from other projects. Mid-tier companies, however, may not possess the internal knowledge on how to create linkages, so the impact of supporting these companies may be larger. By working through the national chambers of mines or of oil and gas, international development cooperation may reach a larger group, which is likely to be composed of companies from all tiers and could help to coordinate EI companies'

¹⁰³ www.equip-project.org

¹⁰⁴ Morrissey (2012) argues that "The fact that organizations such as the World Bank (and donors more generally) did not advocate industrial policy diminished the importance of such policy issues on the domestic agenda. For sub-Saharan African countries, this is one of the reasons why they failed to develop the domestic capacity to benefit from FDI."

action with regard to linkage creation across the industry, thereby achieving economies of scale. Development partners should also carefully assess which companies to support in their supplier programmes. While international development cooperation often prioritizes the promotion of SMEs, the technology gap of these companies in developing countries may be too large to create lasting upstream linkages. It may therefore be worthwhile for development partners to concentrate on supporting those larger local firms able to create lasting upstream linkages.

[Upstream, downstream, spatial, knowledge and technology linkages]

Recommendation D6

Help local companies, in particular those owned by women, access finance and meet the standards required to service EI companies in order to increase local procurement opportunities. International development cooperation can provide financing since many resource-rich developing countries' financial markets suffer from severely limited access to credit and high interest rates. In some countries, female entrepreneurs are excluded from this by limited access to finance, as discussed in section 2.2. Development partners should adapt their programmes to increase the financial inclusion of women. Technical Cooperation can also support local companies by linking them up with their peers in the investors' countries, which may lead to joint ventures and knowledge transfer.¹⁰⁵ More developed local companies' access to foreign markets can be supported by helping them to achieve certification standards and providing contacts to mining subsidiaries in other jurisdictions, as was done in Chile. Given the well-recognized "Mittelstand" companies in Germany, German Development Cooperation is well placed to provide support to small and medium sized companies.¹⁰⁶ This is also a key component of German Technical and Financial Cooperation.

[Upstream and knowledge and technology linkages]

Recommendation D7

Leverage the experience and expertise of private sector development initiatives and vocational training programmes. While EI companies understand what is needed to make their operations efficient and profitable, they are less familiar with private sector development not directly related to their operations. However, governments' policy decisions on private sector development are often constrained by political pressures, wherefore they might design unrealistic local content targets (see recommendation G3). Development partners, although not necessarily focused on linkages to the EI sector, do often have experience in private sector development initiatives elsewhere. They are therefore well placed to advise both governments and companies on how to create linkages.¹⁰⁷ The most critical factor in developing linkages in resource-rich countries is the lack of local industrial capacity and expertise. Educational support and training is another area in which international development cooperation is heavily involved. Especially Germany is well known for its dual education system and its vocational training programmes.

[Upstream, horizontal, knowledge and technology linkages]

Recommendation D8

Long-term support programmes are required in order to create linkages given that it takes time to build and sustain these successfully.¹⁰⁸ While aid might be subject to the diplomatic and political cycles of donor countries, a cyclical approach to linkages is unlikely to succeed.

[Upstream, downstream, horizontal, knowledge and technology linkages]

Recommendation D9

Place cautious focus on artisanal mining, given that this sector provides substantial employment opportunities¹⁰⁹ and therefore can be a driver in poverty reduction, but at the same time has had devastating impacts on health and the environment. Furthermore, EI company investments often clash with local communities if a large-scale mine is to be

¹⁰⁵ This is also an approach in development at a leading oil company (Interview with corporate expert, August 2015).

¹⁰⁶ In this context, please note recommendation D5, which states that it may also be worth to consider supporting larger national companies and not only SMEs.

¹⁰⁷ For instance, GIZ South Africa organized a workshop with the Chamber of Mines in Madagascar to present government officials with international experiences on linkages and local content (Interview with GIZ South Africa, August 2015).

¹⁰⁸ As highlighted by Buur et al (2013), "[t]he start-up and development of industries linked to extractive industries is slow, takes time and requires funds as well as the technical and institutional knowhow that some donors may be able to provide".

¹⁰⁹ ASM is estimated to directly or indirectly employ over 100 million people around the globe and to account for over one-sixth of the world's non-fuel mineral output (Communities and Small-Scale Mining, Working Together: How Large-Scale Mining Can Engage with Artisanal and Small-Scale Mining, (Washington, World Bank IFC, January 2008), 5). In a 2013 report, the World Bank estimates that 13 million people in 30 countries work in micro and small artisanal mining (World Bank (2013): Small-Scale Mining in: <http://webworldbank.org>).

built in an area that was previously home to artisanal mining. While artisanal mining is complex and politically very sensitive because these operations are largely occurring in the informal sector, development partners could play an important role in trying to help formalize the sector and provide trainings and tools that reduce its adverse impacts on health and the environment.

[No immediate linkage]

Recommendation D10

Be aware of the political economy of resource-rich developing countries before assisting governments and promote good governance in order to both determine the 'political will' for broad-based linkage creation and avoid clientelism and patronage. The EI sector is characterised by large investment flows and rent-seeking behaviour. Furthermore, linkage creation is a long-term endeavour where results are unlikely to be highly visible within one election cycle. These attributes create incentives for the political elite to personally benefit from short-term upstream and downstream contracts or infrastructure solutions that are sub-optimal from an economic and regional perspective. Such decisions may impede longer-term broad-based transfer of knowledge and technology as well as diversification and regional integration. Thus, development partners face the difficult challenge of designing their linkage support programmes in a way that reflects good practices while fitting local contexts, institutions, and politics. Trade-offs regarding good practices may be required to get the political buy-in necessary for a successful implementation of linkage creation programmes. In jurisdictions where corruption is high and governance is weak, it will be very difficult to create sustainable long-term linkages that do not only benefit a selected few in the political elite. In such cases, international development cooperation may want to consider placing greater emphasis on the development institutions and the promotion of transparency on who owns the companies that benefit from EI contracts.

[All linkages]

Overview of linkages

- **ICMM (2014):** The Role of Mining in National Economies (2nd edition): Mining's Contribution to Sustainable Development.
- **World Bank (2012):** Gender Dimensions of Artisanal and Small-Scale Mining: A Rapid Assessment Toolkit, World Bank Group's Oil, Gas, and Mining Unit.
- **World Gold Council (2015):** The Social and Economic Impacts of Gold Mining, Maxwell Stamp PLC.

Upstream Linkages

- **African Development Bank, Organisation for Economic Co-operation and Development, United Nations Development Programme, Economic Commission for Africa (2013):** African Economic Outlook 2013, Special Theme: Structural Transformation and Natural Resources.
- **African Oil and Gas Industry, Centre de Recherches Entreprises et Sociétés, Akinlo, A. E. (2004):** Foreign Direct Investment and Growth in Nigeria: An Empirical Investigation, *Journal of Policy Modeling*, vol. 26, no. 5, pp. 627-639.
- **Amendolaigne, V., Boly, A., Coniglio, N. D., and Prota, F. (2013):** FDI and Local Linkages in Developing Countries: Evidence from Sub-Saharan Africa. *World Development*, vol. 50 pp. 41-56.
- **Anglo American (2015):** Tax and Economic Contribution Report 2014, Focus on Transparency.
- **Apoyo (2009):** Study of the Yanacocho Mine's Economic Impacts by Apoyo for the IFC, International Finance Corporation, Lima.
- **BP (2015):** Sustainability Report 2014: Building a stronger safer BP.
- **Bwalya, S. M. (2006):** Foreign Direct Investment and Technology Spillovers: Evidence from Panel Data Analysis of Manufacturing Firms in Zambia, *Journal of Development Economics*, vol. 81, no. 2, pp. 514-526.
- **Economic Commission for Africa (2013):** Making the Most of Africa's Commodities: Industrializing for Growth, Jobs and Economic Transformation.
- **Fairphone (n.d):** <https://www.fairphone.com/2015/08/20/supporting-fairer-mineral-initiatives-with-the-fairphone-2/> (accessed October 2015).
- **Fessehaie, J. (2011):** Development and Knowledge Intensification in Industries Upstream of Zambia's Copper Mining Sector, *MMCP Discussion Paper*, University of Cape Town and the Open University.
- **GIZ (2014):** Encyclopedia of Gender and Mining: Key Initiatives, Best Practices and Actors.
- **GIZ (2015):** Sustainable Economic Development in Resource-Rich Countries, Guidelines for Technical Cooperation.
- **Hansen, M.W. (2014):** From Enclave to Linkage Economies? A Review of the Literature on Linkages between Extractive Multinational Corporations and Local Industry in Africa, *DIIS Working Paper*, 2014, no.02. Copenhagen, Danish Institute for International Studies.
- **ICMM (2014):** Enhancing mining's contribution to the Zambian economy and society, April 2014, Accessible Online: <http://www.icmm.com/document/7065>.
- **International Finance Corporation (IFC, 2015):** The Art and Science of Benefit Sharing in the Natural Resource Sector, A discussion paper. International Finance Corporation, Washington DC.
- **Kaplinsky, R. (2011):** Commodities for Industrial Development: Making Linkages Work. Working Paper 01/2011, United Nations Industrial Development Organization.
- **Kapstein, E., and Kim, R. (2011):** The Socio-Economic Impact of Newmont Ghana Gold Limited, Stratcomm Africa (Strategic Communications Africa Ltd.), Haarlem, June.
- **Larsen, M. N., Yankson, P., and Fold, N. (2009):** Does FDI Create Linkages in Mining? The Case of Gold Mining in Ghana. In *Transnational Corporations and Development Policy: Critical Perspectives*, pp. 247-273, Palgrave Macmillan UK.
- **McKinsey Global Institute (2013):** Reversing the Curse: Maximizing the Potential of Resource Driven Economies.
- **McMahon, G., and S. Moreira (2014):** The Contribution of the Mining Sector to Socio-Economic and Human Development, World Bank, Washington, DC.
- **Merlevede, B., Schoors, K., and Spatareanu, M. (2011):** FDI Spillovers and the Time since Foreign Entry, Ghent University Faculty of Economics and Business Administration, *Ghent University Working Paper*, no. 713.
- **Mjimba, V. (2011):** The Nature and Determinants of Linkages in Emerging Minerals Commodity Sectors: A Case Study of Gold Mining in Tanzania, *MMCP Discussion Paper*, Milton Keynes and Cape Town, The Open University and University of Cape Town.
- **Morris, M., Kaplinsky, R. and Kaplan, D. (2012):** One Thing Leads to Another – Commodities, Linkages and Industrial Development - A Conceptual Overview, *MMCP Discussion Paper*, Milton Keynes and Cape Town, The Open University and University of Cape Town.

- **Morrissey, O.** (2012): FDI in Sub-Saharan Africa: Few Linkages, Fewer Spillovers, *European Journal of Development Research*, vol. 24, no. 1, pp. 26-31.
- **Ovadia, J.** (2013): Measurement and Implementation of Local Content in Nigeria – a Framework for Working with Stakeholders to Increase the Effectiveness of Local Content Monitoring and Development, Lagos: Centre for Public Policy Alternatives (CPPA), available at: <http://cparesearch.org/wp-content/uploads/2014/12/FOSTER-Measurement-and-Implementation-of-Local-Content.pdf>.
- **Ovadia, J.** (2013b): Indigenization vs. Domiciliation: A Historical Approach to National Content in Nigeria's Oil and Gas Industry, In Falola, T., and Achberger, J., ed., *The Political Economy of Development and Underdevelopment in Africa*. London: Routledge, 2013, pp. 47-73.
- **Ovadia, J.** (2014): Local Content and Natural Resource Governance: The Cases of Angola and Nigeria. *The Extractive Industries and Society*, 2014, vol. 1, no. 2, pp. 137-146.
- **Peek, P. and Gantès P.** (2008): Skills Shortages and Local Content in the Sub-Saharan.
- **Ramdoo, I.** (2013): Fixing Broken Links: Linking extractive sectors to productive value chains, Discussion Paper, no. 143, European Centre for Development Policy Management.
- **Ramdoo, I.** (2015): Resource-based Industrialisation in Africa Optimising Linkages and Value Chains in the Extractive Sector, Discussion Paper, no. 179, European Centre for Development Policy Management.
- **European Commission** (2012): Oil and Gas Sector Guide on Implementing the UN Guiding Principles on Business and Human Rights, available at: http://www.ihrb.org/pdf/eu-sector-guidance/EC-Guides/O%26G/EC-Guide_O%26G.pdf.
- **Tordo, S., Warner, M., Manzano, O. F. and Anouti, Y.** (2013): Local Content Policies in the Oil and Gas Sector. World Bank Study, World Bank, Washington, DC.
- **United Nations Human Rights Office of the High Commissioner** (2011): UN Guiding Principles on Business and Human Rights: Implementing the United Nations 'Protect, Respect and Remedy' Framework, available at: http://www.ohchr.org/Documents/Publications/Guiding-PrinciplesBusinessHR_EN.pdf.
- **UNCTAD** (2012): Extractive Industries: Optimizing Value Retention in Host Countries, United Nations publication.
- **UNCTAD** (2013): Commodities and Development Report: Perennial Problems, New Challenges and Evolving Perspectives, United Nations publication.
- **World Bank** (2012): Increasing Local Procurement By the Mining Industry in West Africa, World Bank Study, World Bank, Washington, DC.
- **World Bank, CSR** (2015): The Economic Contributions from Industrial Mining in Madagascar.

Downstream Linkages

- **African Union** (2009): Africa Mining Vision.
- **Balise, J.** (2015): Botswana Diamonds Beneficiation under Threat. Sunday Standard Online Edition. August 10, 2015.
- **Bellefleur, D.** (2014): Indonesia: Mining Industry, Indonesia Export Ban. Tractus Issue ID. 2.
- **Brook, M.** (2012): The Journey of Botswana's Diamonds. Diamond Trading Company Botswana.
- **Castel-Branco, C. and Goldin, N.** (2003): Impacts of the Mozal Aluminium Smelter on the Mozambican Economy.
- **CCSI** (2013): Leveraging Paraguay's Hydropower for Sustainable Economic Development.
- **FitzGerald, B.** (2004): Troubled BHP plant faces closure, The Age, November 12, 2004.
- **Grynberg, R.** (2015): Botswana Diamond Workers Bleed: Rising Costs Have Exposed Flaws in a Beneficiation Deal that Should Have Been Clear-cut, Mail & Guardian, February 20, 2015. 19 – 25 February 2015, Accessible Online: <http://mg.co.za/article/2015-02-19-botswana-diamond-workers-bleed>.
- **Hirschman, A. O.** (1981): Essays in Trespassing: Economics to Politics and Beyond. New York, NY, Cambridge University Press.
- **Justica Ambiental, Jubilee Debt Campaign UK, Tax Justice Network** (2012): Whose Development is it? Investigating the Mozal Aluminium Smelter in Mozambique.
- **Klinger, P.** (2011): Rio Terminates Kwinana Hismelt plant, The West Australian. January 19, 2011
- **Morris, M., Kaplinsky, R. and Kaplan, D.** (2011): Commodities and Linkages Industrialisation in Sub Saharan Africa, MMCP Discussion Paper, Milton Keynes and Cape Town, The Open University and University of Cape Town.
- **Nathan Associated** (2013): Economic Effects of Indonesia's Mineral-Processing Requirements for Export. U.S. Agency for International Development.

- **Ramdoos, I. and Bilal, S.** (2014): Extractive Resources for Development: Trade, Fiscal and Industrial Considerations, European Centre for Development Policy Management, Discussion Paper, no. 156.
- **World Steel Association** (2014): Steel Statistical Yearbook 2014.

Horizontal Linkages

- **Dahlman, C. J., Routti, J. and Ylä-Anttila, P.** (2006): Finland as a Knowledge Economy. Elements of Success and Lessons Learned. Overview World Bank Institute.
- **Hirschman A.** (1977): A Generalized Approach to Development, with Special Reference to Staples in M. Nash, ed., *Essays on Economic Development and Cultural Change in Honor of Bert F. Hoselitz*, Chicago University Press, Chicago IL, pp. 67-98
- **Kaplan, D.** (2011): South African Mining Equipment and Related Services: Growth Constraints and Policy, *MMCP Discussion Paper*. Milton Keynes and Cape Town, The Open University and University of Cape Town.
- **Morris, M., Kaplinsky R. and Kaplan D.** (2012): One Thing Leads to Another: Promoting Industrialization by Making the Most of the Commodity Boom in sub-Saharan Africa.
- **Morrissey, O.** (2012): FDI in Sub-Saharan Africa: Few Linkages, Fewer Spillovers, *European Journal of Development Research*, vol. 24, no. 1, pp. 26-31.
- **Pogue, T. E.** (2008): Missed Opportunities? A Case Study from South Africa's Mining Sector.
- **Walker, M.** (2005): Supply Relationships in the Mining Capital Goods and Services Cluster: The Case of PGMs', Paper presented at the Trade and Capital Goods and Services Cluster: The Case of PGMs', Paper presented at the Trade and Industrial Policy Strategies 2005 Annual Forum Johannesburg.

Consumption Linkages

- **Bastida, A. E.** (2014): From Extractive to Transformative Industries: Paths for Linkages and Diversification for Resource-driven Development, *Mineral Economics*, vol. 27, no. 2-3, pp. 73-87.
- **Hailu, D., Gankhuyag, U. and Kipgen, C** (2014): How Does the Extractive Industry Promote Growth, Industrialization and Employment Generation?, Paper presented to the United Nations Development Programme and Government of Brazil, Dialogue on the Extractive Sector

and Sustainable Development – Enhancing Public-Private-Community Cooperation in the context of the Post-2015 Agenda, Brasilia, Brazil, 3-5 December 2014.

- **Kaplinsky, R.** (2011): Commodities for Industrial Development: Making Linkages Work, Working Paper 01/2011, UNIDO.
- **Kaplinsky, R.** (2012): Promoting Industrial Diversification in Resource Intensive Economies: The Experiences of Sub-Saharan Africa and Central Asia Regions, UNIDO, available at: http://www.unido.org/fileadmin/user_media/Publications/Pub_free/Promoting%20Industrial%20Diversification%20Report.pdf.
- **Ostenson, O.** (2014): The Employment Effect of Mine Employees' Local Expenditure, *Mineral Economics*, vol. 27, no. 2-3, pp. 135-142.
- **Sachs, L. and Maennling, N.** (2015): Resource Resilience: How to Break the Commodities Cycle, World Politics Review, May 26, 2015.
- **Sapelli, C.** (2003): The Political Economics of Import Substitution Industrialization, December 2003, available at: <https://ideas.repec.org/p/ioe/doctra/257.html>.
- **Silva, E.** (2007): The Import-Substitution Model: Chile in Comparative Perspective, *Latin American Perspectives*, vol. 34, no. 3, pp. 67-90.

Knowledge and technology transfer

- **Aitken B., Gordon H. Hanson and Ann E. Harrison** (1997): Spillovers, Foreign Investment, and Export Behavior. *Journal of International Economics*, vol. 43, no. 1, pp. 103-132.
- **Anglo American and the International Finance Corporation** (2008): The Anglo Zimele Model: A Corporate Risk Capital Facility Experience.
- **Blomström, M and Kokko, A** (1998): Multinational Corporations and Spillovers, *Journal of Economic Surveys*, vol. 12, no. 3, pp. 247-277.
- **Bwalya, S. M.** (2006): Foreign Direct Investment and Technology Spillovers: Evidence from Panel Data Analysis of Manufacturing Firms in Zambia, *Journal of Development Economics*, vol. 81, no. 2, pp. 514-526.
- **Chen, Y. and Puttitanun, T.** (2005): Intellectual Property Rights and Innovation in Developing Countries, *Journal of Development Economics*, vol. 78, no. 2, pp. 474-93.
- **Clerides, S., Lach, S. and Tybout, J.** (1998): Is Learn-

- ing by Exporting Important? Micro- Dynamic Evidence from Colombia, Mexico and Morocco, *Quarterly Journal of Economics*, pp. 903-947.
- **Crespo, N. and Fontoura M.** (2007): Determinant Factors of FDI Spillovers: What Do We Really Know?, *World Development*, vol. 35, no. 3, pp. 410-425.
 - **Dwyer, J., Jones, Z., Westerby, P., Carrigan, D., Butler, K., and Union, B.** (2013): Review of Brazil's National Oil Company, Bauer College of Business, University of Houston.
 - **Farole, T., and Winkler, D.** (2014): Making Foreign Direct Investment Work for Sub-Saharan Africa: Local Spillovers and Competitiveness in Global Value Chains, World Bank, Washington, DC.
 - **Findlay, R.** (1978): Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology: a Simple Dynamic Model, *Quarterly Journal of Economics*, vol. 92, no. 1, pp. 1-16.
 - **Foray, D.** (2009): Technology Transfer in the TRIPS Age: The Need for New Types of Partnerships between the Least Developed and Most Advanced Economies, International Centre for Trade and Sustainable Development, Geneva.
 - **Fosfuri, A., Motta, M., and Ronde, T.** (2001): Foreign Direct Investment and Spillovers Through Workers Mobility, *Journal of International Economics*, vol. 53, no. 1, pp. 205-222.
 - **Gana, J.** (1992): Determinants of Innovation in Copper Mining, *Resources Policy*, vol. 18, no. 1, pp. 21-31.
 - **Ghebrihiwet, N.** (2016): FDI Technology Spillovers in Extractive Industries: Lessons from Practice, available at: <http://dare.uvu.vu.nl/bitstream/handle/1871/54324/rm2016-2-2.pdf?sequence=1>
 - **Greenaway, D., Sousa, N. and Wakelin, K.** (2004): Do Domestic Firms Learn to Export from Multinationals?, *European Journal of Political Economy*, vol. 20, no. 4, pp. 1027-1043.
 - **Gulbrandsen, M. and Nerdrum, L.** (2007): Public Sector Research and Industrial Innovation in Norway: a Historical Perspective, Centre for Technology, Innovation Culture (TIK), University of Oslo.
 - **Hassan, E., Yaqub, O., and Dipeveen, S.** (2010): Intellectual Property and Developing Countries: A Review of the Literature, RAND.
 - **Innovum** (2014): Proveedores De La Minería Chilena Estudio De Caracterización, Fundación Chile.
 - **Javorcik, B. S.** (2004): Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages, *American Economic Review*, vol. 94, pp. 605-27.
 - **Kinoshita, Y.** (2001): R&D and Technology Spillovers through FDI: Innovation and Absorptive Capacity, CEPR discussion paper 2775, Centre for Economic Policy Research, London.
 - **Knell, M. and Rojec, M.** (2011): Why is there Little Evidence of Knowledge Spillovers from Foreign Direct Investment?
 - **Kokko, A.** (1994): Technology, Market Characteristics, and Spillovers, *Journal of Development Economics*, vol. 43, no. 2, pp. 279-293.
 - **Kugler, M.** (2006): Spillovers from Foreign Direct Investment: Within or Between Industries?, *Journal of Development Economics*, vol. 80, no. 2, pp. 444-477.
 - **Lapan, H. and Bardhan, P.** (1973): Localized Technical Progress and Transfer of Technology and Economic Development, *Journal of Economic Theory*, vol. 6, no.6, pp. 585-595.
 - **Léger A.** (2007): Intellectual Property Rights and Innovation Around the World: Evidence from Panel Data, German Institute of Economic Research Discussion Papers, no. 696.
 - **Maskus, K.** (2000): Intellectual Property Rights in the Global Economy, Institute for International Economics, Washington, DC.
 - **Maskus, K. E.** (2004): The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer, In C. Fink and K.E. Maskus, eds., *Intellectual Property and Development: Lessons from Recent Economic Research*, pp. 41-74, Oxford University Press/World Bank, New York.
 - **Nicholson, M.W.** (2007): The Impact of Industry Characteristics and IPR Policy on Foreign Direct Investment, *Review of World Economics*, vol. 143, no. 1, pp. 27-54.
 - **Park, W. and Lippoldt, D.** (2008): Technology Transfer and the Economic Implications of the Strengthening of Intellectual Property Rights in Developing Countries, OECD Trade Policy Working Papers 62.
 - **Primo Braga, C., Fink, C. and Paz Sepulveda, C.** (2000): Intellectual Property Rights and Economic Development, World Bank Discussion Papers 412.
 - **Sinani, E. and Meyer, K.** (2004): Spillovers of Technology Transfer from FDI: the Case of Estonia, *Journal of Comparative Economics*, vol. 32, pp. 445-466.

- **Smith, P.J.** (2001): How Do Foreign Patent Rights Affect US Exports, Affiliate Sales and Licenses?, *Journal of International Economics*, vol. 55, no. 2, pp. 411–39.
- **Sönmez, A.** (2013): Multinational Companies, Knowledge and Technology Transfer: Turkey's Automotive Industry in Focus, Springer Science & Business Media.
- **Walker, M.** (2005): Supply Relationships in the Mining Capital Goods and Services Cluster: The Case of PGMs', Paper presented at the Trade and Industrial Policy Strategies 2005 Annual Forum Johannesburg.
- **Wang, J., and Blomstrom, M.** (1992): Foreign Investment and Technology Transfer: a Simple Model, *European Economic Review*, vol. 36, pp. 137-155.
- **Wise, H. and Shtylla S.** (2007): The Role of the Extractive Sector in Expanding Economic Opportunity, Harvard Kennedy School of Government.
- **CCSI** (2014): A Framework to Approach Shared-Use of Mining-Related Infrastructure, March 2014, available at: http://ccsi.columbia.edu/files/2014/05/A-Framework-for-Shared-use_March-2014.pdf.
- **Frost & Sullivan** (2012): CEO 360 Degree Perspective of the Global Mining Water and Wastewater Treatment Market, Paulina Szyplinska, 11 May 2012.
- **Global Water Intelligence** (2011): Mining a rich seam for water companies, vol. 12, no. 7, available at: <http://www.globalwaterintel.com/archive/12/7/general/mining-rich-seam-water-companies.html>.
- **International Finance Corporation (IFC)**, (2013): Fostering Greenfield Mining-associated Shared Transport Infrastructure through PPPs: Challenges and Solutions for Sub-Saharan Africa, Presentation, Cape Town, February 2013.
- **Ireland, G.** (2015): Moving Towards a Sustainable Shared-Use Mining Infrastructure Model, in the World Economic Forum's Mining & Metals Industry Vision 2015, (January 2015), available at: <http://www.infra-share.org/category/publications>.
- **Thomas S.** (2012): Water and Mining: a Love/Hate Relationship?, *Water World*, vol. 27, no. 3, available at: <http://www.waterworld.com/articles/wwi/print/volume-27/issue-3/regional-spotlight/latin-america/water-and-mining-a-love-hate.html>.
- **Toledano, P. and Roorda, C.** (2014): Leveraging Mining Demand for Internet and Telecommunications Infrastructure for Broad Economic Development: Models, Opportunities and Challenges, CCSI, June 2014, available at: <http://ccsi.columbia.edu/files/2014/05/CCI-Policy-Paper-Leveraging-Mining-Related-ICT-Infrastructure-for-Development-June-20141.pdf>.
- **Sigam, C. and Garcio, L.** (2012): Extractive Industries: Optimizing Value Retention in Host Countries, UNCTAD.
- **Singer, H.** (1975): The Distribution of Gains from Trade and Investment—revisited, *Journal of Development Studies*, vol. 11, no. 4, pp. 376–382.
- **World Bank, Banerjee, S. G., Romo, Z., McMahon, G., Toledano, P., Robinson, P. and Pérez Arroyo, I.** (2015): The Power of the Mine, A Transformative Opportunity for Sub-Saharan Africa, World Bank, Washington, DC.
- **Rio Tinto** (2015): Catalyst for Growth Case study, available at: www.riotinto.com/sd2014/casestudies/catalyst-for-growth.html.

Spatial linkages

- **CCSI** (2014): A Framework to Approach Shared-Use of Mining-Related Infrastructure, March 2014, available at: http://ccsi.columbia.edu/files/2014/05/A-Framework-for-Shared-use_March-2014.pdf.
- **Frost & Sullivan** (2012): CEO 360 Degree Perspective of the Global Mining Water and Wastewater Treatment Market, Paulina Szyplinska, 11 May 2012.
- **Global Water Intelligence** (2011): Mining a rich seam for water companies, vol. 12, no. 7, available at: <http://www.globalwaterintel.com/archive/12/7/general/mining-rich-seam-water-companies.html>.
- **International Finance Corporation (IFC)**, (2013): Fostering Greenfield Mining-associated Shared Transport Infrastructure through PPPs: Challenges and Solutions for Sub-Saharan Africa, Presentation, Cape Town, February 2013.
- **Ireland, G.** (2015): Moving Towards a Sustainable Shared-Use Mining Infrastructure Model, in the World Economic Forum's Mining & Metals Industry Vision 2015, (January 2015), available at: <http://www.infra-share.org/category/publications>.
- **Thomas S.** (2012): Water and Mining: a Love/Hate Relationship?, *Water World*, vol. 27, no. 3, available at: <http://www.waterworld.com/articles/wwi/print/volume-27/issue-3/regional-spotlight/latin-america/water-and-mining-a-love-hate.html>.
- **Toledano, P. and Roorda, C.** (2014): Leveraging Mining Demand for Internet and Telecommunications Infrastruc-

Constraints on linkage policies: International Legal Framework, Globalisation and Automation

- **Columbia Center on Sustainable Investment (CCSI), International Institute for Sustainable Development (IISD)** (2016): Automated Mining Technologies – A Revolution in Progress, forthcoming publication.
- **Columbia Center on Sustainable Investment (CCSI), International Institute for Sustainable Development (IISD), Engineers Without Borders (EWB)** (2016): Mine of the future and impact of local content strategies [Provisional Title], Forthcoming publication.
- **Hansen, M.W.** (2014): From Enclave to Linkage Economies? A Review of the Literature on Linkages between Extractive Multinational Corporations and Local Industry in Africa, DIIS Working Paper, no. 2, Copenhagen, Danish Institute for International Studies.
- **Horberry, T., and Lynas, D.** (2012): Human Interaction with Automated Mining Equipment: The Development of an Emerging Technologies Database, *Ergonomics Australia*, vol. 8, pp 1-6.
- **Milanovic, B.** (2003): The Two Faces of Globalisation: Against Globalisation as We Know It?, *World Development*, vol. 31, no. 4, pp. 667–683.

- **Morris, M., Kaplinsky, R. and Kaplan, D.** (2012): One Thing Leads to Another – Commodities, Linkages and Industrial Development - A Conceptual Overview, MMCP Discussion Paper, Milton Keynes and Cape Town, The Open University and University of Cape Town.
- **Ovadia, J.** (2012): The Dual Nature of Local Content in Angola's Oil and Gas Industry: Development vs. Elite Accumulation, *Journal of Contemporary African Studies*, vol. 30, no. 3, pp. 395-417.
- **Peterson, D. J., LaTourette, T, & Bartis, J. T.** (2001): New Forces at Work in Mining: Industry Views of Critical Technologies, Rand Corporation.
- **Ramdoe, I.** (2013): Fixing Broken Links: Linking extractive sectors to productive value chains, Discussion Paper, no. 143, European Centre for Development Policy Management.
- **Shift** (2012): Respecting Human Rights Through Global Supply Chains, Shift Workshop Report No. 2, October 2012, available at: <http://shiftproject.org/sites/default/files/%20Respecting%20Human%20Rights%20Through%20Global%20Supply%20Chains%20Report.pdf>
- **Toledano P.** (2015): Global Value Chains and Resource Corridors: The Nexus is Regional Integration, GREAT Insights Magazine, vol. 4, no. 6, December 2015.
- **UNCTAD** (2013): World Investment Report 2013: Global Value Chains: Investment and Trade for Development, United Nations publication.
- **UNCTAD.** (2015): World Investment Report 2015: Reforming International Investment Governance, United Nations publication.
- **UNECA** (2013): Making the Most of Africa's Commodities: Industrializing for Growth, Jobs and Economic Transformation, Economic Commission for Africa, Addis Ababa.
- **Wu M. and Salzman, J.** (2014): The Next Generation of Trade and Environment Conflicts: The Rise of Green Industrial Policy, *Northwestern University Law Review*, vol. 108, no. 2, pp. 401-474.
- **World Bank** (2015): Breaking out of Enclaves: Leveraging Opportunities from Regional Integration in Africa to Promote Resource-Driven Diversification, World Bank publication.
- **Ker, P.** (2015): Rio Tinto pushes ahead with driverless trains in Pilbara, *Sydney Morning Herald*, March 10, 2015, available at: <http://www.smh.com.au/business/mining-and-resources/rio-tinto-pushes-ahead-with-driverless-trains-in-pilbara-20150309-13z28v.html>.
- **Spence, R.** (2014): Top Driverless Trucks in the Mining Industry Today Plus Future Concepts, *Mining Global*, July 7, 2014, available at: <http://www.miningglobe.com/machinery/947/Top-Driverless-Trucks-in-the-Mining-Industry-Today>.

Recommendations

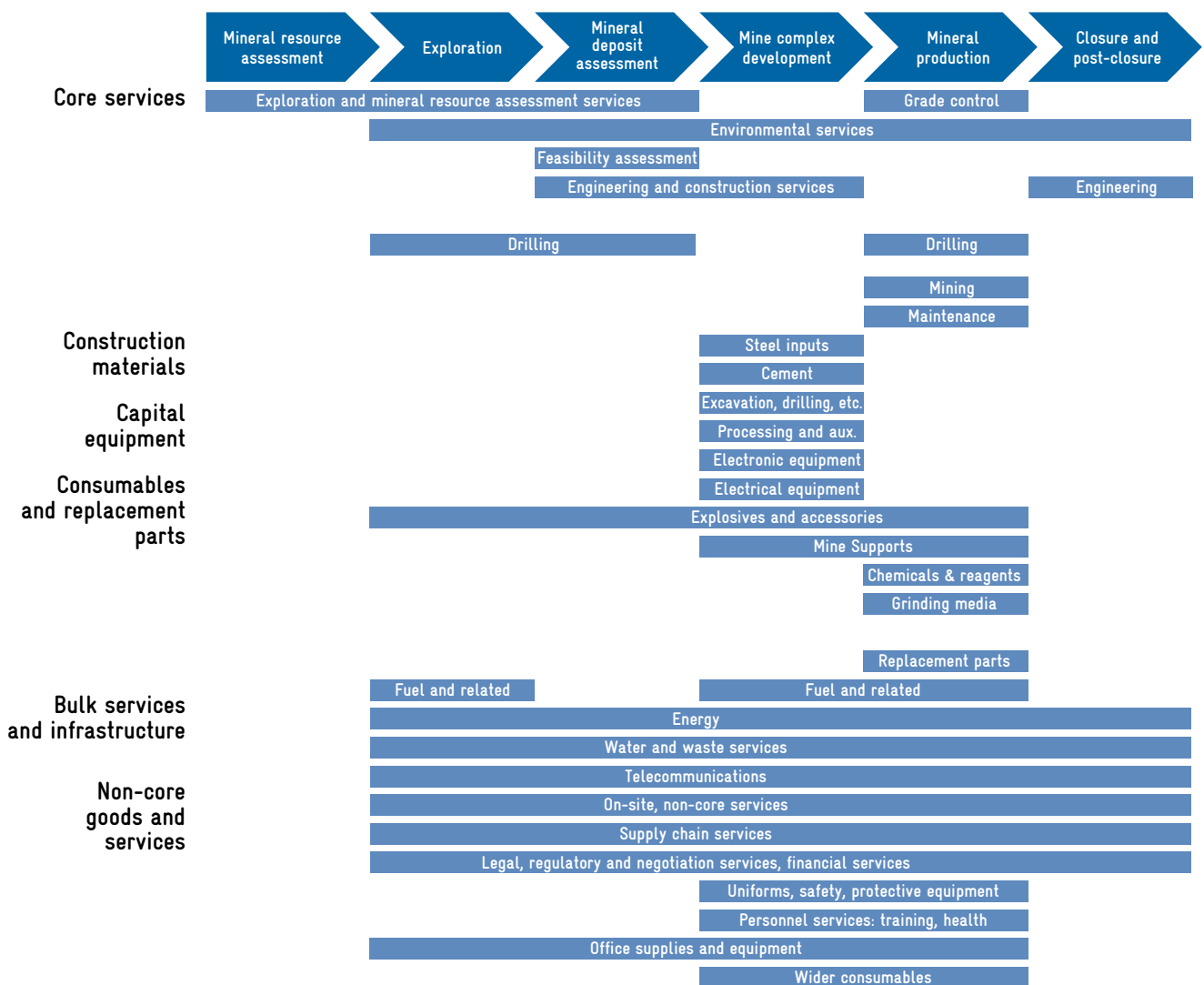
- **Buur L., Therkildsen, O., Hansen, M. W. and Kjær, M.** (2013): Extractive Natural Resource Development: Governance, Linkages and Aid, *DIIS Working Paper 2013*, no. 28, Copenhagen, Danish Institute for International Studies.
- **CCSI profiles local content legal and policy profiles of countries**, available at: <http://ccsi.columbia.edu/work/projects/local->
- **The International Growth Centre**, available at <http://www.theigc.org>.
- **World Bank** (2008): Communities and Small-Scale Mining, Working Together: How Large-Scale Mining Can Engage with Artisanal and Small-Scale Mining, World Bank International Finance Corporation, Washington.
- **World Bank** (2013): Small-Scale Mining, available at <http://webworldbank.org>.

6

ANNEX

Annex 1 – Visualization of frameworks designed to expand local procurement opportunities over the life of an EI project

Figure 6.1: Opportunities for upstream linkages along the mine life cycle



Source: World Bank (2012), Increasing Local Procurement By the Mining Industry in West Africa.

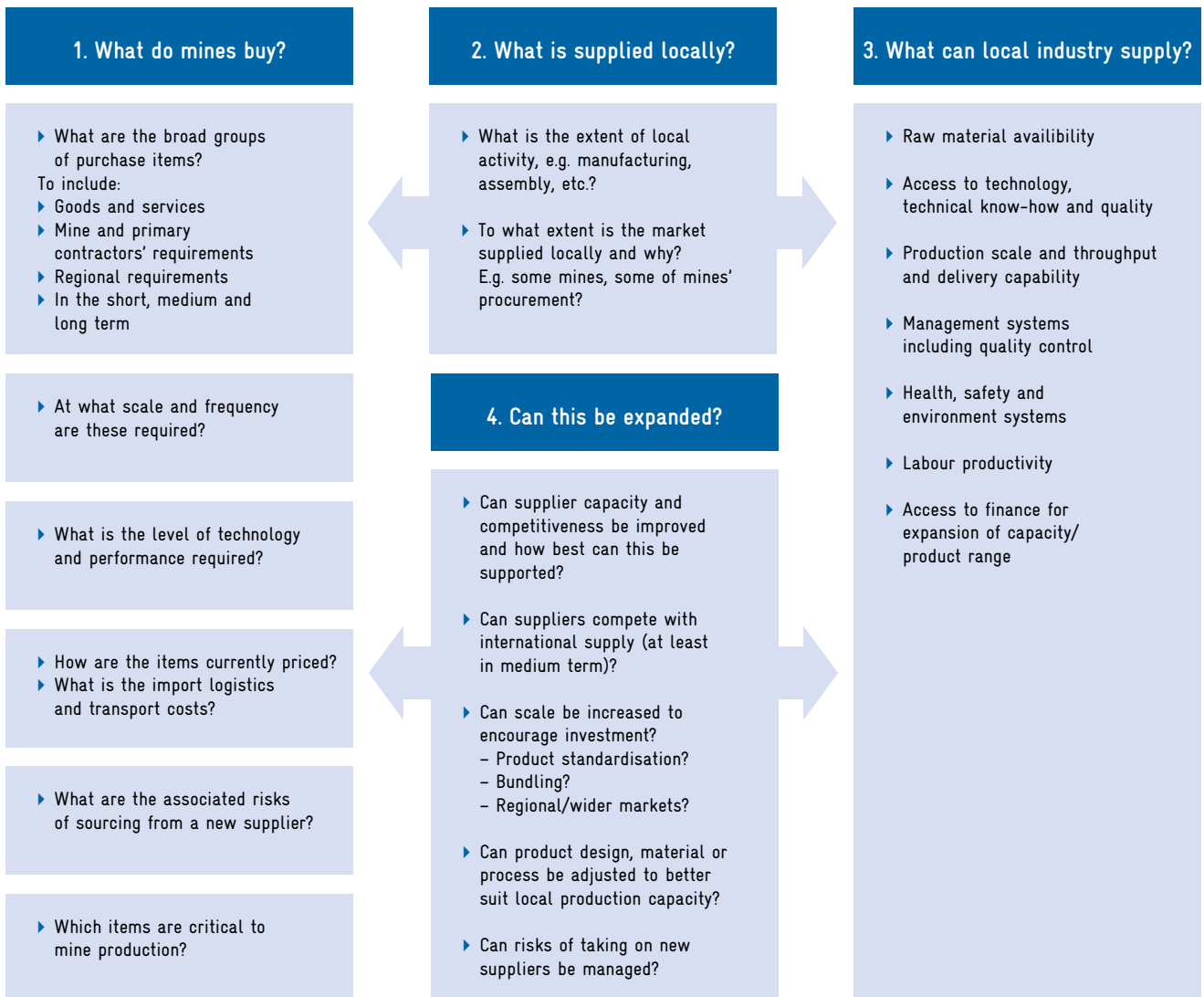
Figure 6.2: Procurement opportunities along the oil and gas value chain

Goods	Exploration	Development	Production	Oil & Gas Treatment & LNG	Transport & Storage	Refining	Petrochem.	Primary Distribution
Subsea Equipment	Wellheads, Sub-surface Safety Valves, Compressors, Meters, Separators, Risers, Umbilicals							
Downhole Equipment	Casing Hardware, Completion Equipment, Drilling tools, Wireline Logging Tools, Perforating Systems							
Tubular Goods	Drill Pipe, Casing, Tubing, Manifolds							
Rigs, Platforms & FPSOs	Land Rigs, Offshore Fabrication, Vessel Conversions, Rig Equipment, Unit Manufacturing			Steel Structures, Production Topsides		Steel Structures		
Rotating Equipment				Compressors, Blowers, Turbines & Pumps				
Static Equipment				Surface Equipment, Columns & Exchangers	Transport Pipes, Tanks	Columns & Exchangers (e.g. Reactors, Vessels)		
Pipes, Valves & Fittings				Pipes, Valves & Fittings				
Electrical Equipment				Transformers & Switchboards, Drive Motors, Cables				
Instrumentation & Control	Sub-surface Sensors, Surface Production Monitoring (e.g. Separators, Multi-phase Flowmeters)			Control Systems & Valves, Instruments & Analysers				
Fluids & Chemicals	Drilling & Completion Fluids, Upstream Specialty Chemicals			Catalysts & Additives				
Other Materials	Corrosion protection, Insulation, Coating & Painting							

Services	Exploration	Development	Production	Oil & Gas Treatment & LNG	Transport & Storage	Refining	Petrochem.	Primary Distribution
Geophysical Services	Acquisition of Seismic Data, Data Processing Imaging of Reservoirs, Management of Data							
Drilling Services	Land Contract Drilling, Offshore Contract Drilling, Directional Services, Mud Logging							
Reservoir Services	Logging While-Drilling (LWD), Wireline Logging, Production Testing Services							
Well Services	Coil Tubing Services, Well Servicing, Rental & Fishing Services							
Downhole Pumping	Downhole Pumping Services							
Completion Services	Casing & Tubing Services, Coating and Piping, Completion Services							
Engineering & EPC				Engineering, Procurement, Construction and Construction Management			Technology Licensors	
Erection & Trade Works				Upstream Erection & Civil Works	Erection & Civil Works (Pipelines, Depots, Jetties & Terminals)		Erection & Civil Works (Refineries and Processing Plants)	
O&M Services				Facilities O&M, Maintenance, Ship & Rig Maintenance, Dry-Docking				
Logistics	Aviation, Land Transportation Services, Operations Support Vessels, Heavy Goods Transport, Catering							
Utilities	Fuel, Steam, Power, Water Supply and Treatment, Industrial Gases							
Other Services	Auditing and Certification, Inspection, Surveying, Hot-Tapping & Freezing, HSE Services, Consulting				Inspection, Vetting, Pigging			

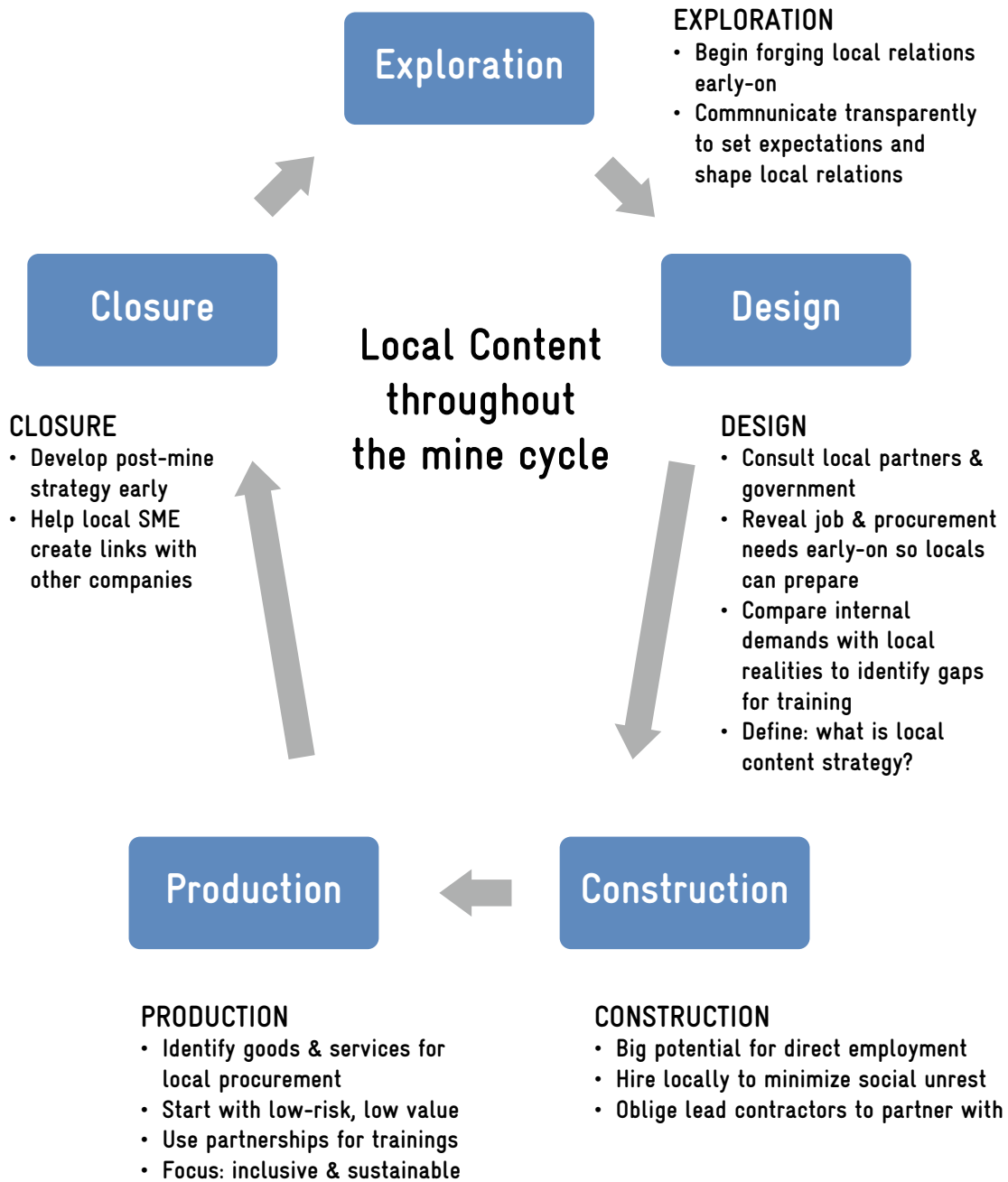
Source: World Bank (2013), Small-Scale Mining.

Figure 6.3: Assessing available upstream linkage opportunities



Source: World Bank (2012), Increasing Local Procurement By the Mining Industry in West Africa.

Figure 6.4: Adjusting local content policy throughout the mine cycle¹¹⁰



Source: GIZ (2014), Maximizing Local Content in Madagascar's Mining Sector, Lessons learned from Madagascar and abroad.

¹¹⁰ Two other phases could be added to this figure, namely, the expansion phase and the cost reduction phase. The former requires high quality and fast response suppliers, while the latter requires cost effective suppliers. Those requirements will only be met through intensified partnerships with training organizations (GIZ, Policy Note: Maximizing Local Content in Madagascar's Mining Sector, Lessons learned from Madagascar and abroad, September 2014).

Annex 2 – World Trade Organization and Local Content – Detailed information

When the WTO came into being in 1995, three new international agreements entered into force that set out certain rules relevant for linkage policies. One is the Agreement on Trade-Related Investment Measures (TRIMs Agreement); the second is the Agreement on Subsidies and Countervailing Measures (SCM Agreement); and the third is the General Agreement on Trade in Services (GATS).

1. TRIMs Agreement

Briefly, the TRIMs Agreement bars two main types of provisions: (1) those that favour the use of domestic over foreign goods, i.e., measures inconsistent with Article III of the General Agreement on Tariffs and Trade (GATT),¹¹¹ or (2) that impose certain quantitative restrictions on imports and exports (i.e., measures inconsistent with Article XI:1 of the GATT).¹¹² Importantly, it only covers measures relating to trade in goods, not trade in services.

The first category of measures prevents countries from imposing measures that would, for example, require or incentivize companies (i.e., by providing tax breaks, subsidies, or other advantages contingent upon the use of domestic goods) to purchase or use locally manufactured equipment instead of foreign-manufactured equipment.

In 2013, the WTO's Dispute Settlement Body (DSB) adopted rulings finding that Canada had breached its obligations under the TRIMs Agreement by requiring renewable energy projects' participation in a sub-national "feed-in-tariff" (FIT) programme in order to achieve a certain amount of domestic content. Evidence submitted during the dispute showed that the requirements adopted by the Canadian province of Ontario could not be satisfied through expenditures on domestic labour and services alone, which would be permitted under the TRIMs Agreement. Instead, meeting the domestic content targets would also require the use of goods manufactured, formed, or assembled in Canada, which resulted in the requirement being inconsistent with the TRIMs Agreement and Article III of the GATT.¹¹³ In order to comply with the DSB's rulings and recommendations, Ontario dropped

the domestic content requirements it had imposed on large renewable energy projects and lowered the domestic content requirements on small and "microFIT" renewable projects.¹¹⁴

The second category prohibits WTO Members from imposing certain trade-balancing and exchange-balancing measures restricting imports and forbids them to restrict exports. Measures restricting imports can be used to favour or require the use of locally produced goods, while measures restricting exports can be used to encourage or require the domestic processing or beneficiation of raw materials.

In 2014, China was held to have breached its WTO obligation not to restrict exports by imposing duties and quotas on the export of various forms of rare earths, molybdenum, and tungsten. China argued that its export restrictions were imposed in order to conserve its exhaustible natural resources and were necessary to reduce harmful environmental pollution caused by mining. Consequently, China argued, those export duties and quotas were covered by relevant exceptions under the WTO, namely Articles XX(b) and XX(g) of the GATT, which, respectively, safeguard measures "necessary for the protection of human, animal, or plant life or health" and "relating to the conservation of exhaustible natural resources."

The WTO panel agreed that mining of the raw materials had in fact caused grave harm to the environment in China, and that, in principle, such export duties or quotas on extraction of natural resources could be shielded by Article XX. Nevertheless, the panel determined that neither exception applied. The panel determined that under the terms upon which China had become a party to the WTO, the Article XX exceptions were not available to it. More relevant for the purposes of linkage policies, the panel concluded that even if the Article XX exceptions were available to China, they would not have covered the measures imposed by China. According to the panel, China's export duties and quotas were not truly or adequately tailored to address those environmental, health, or conservation issues. Instead, at least some of the evidence submitted in the dispute, including statements by China's Ministry of Industry and Information Technology, "seem[ed] to indicate that, contrary to China's assertions, the export duties at issue are designed and structured to promote increased domestic production of high value-added downstream products that use the raw materials at issue in this dispute as inputs".¹¹⁵ Similarly, with respect to the quotas,

111 These are measures violating Article III of the WTO's General Agreement on Tariffs and Trade (GATT). There are certain exceptions under which such measures may be permitted, e.g., if they are either imposed in connection with government procurement (GATT Art. III (8)) or covered by one of the GATT's general exceptions (GATT Art. XX).

112 These measures would violate Article XI:1 of the GATT.

113 Panel Reports, *Canada – Renewable Energy / Feed-In Tariff Programme*, paras. 7.155–7.166, WT/DS412/R, WT/DS426/R (December 19, 2012). The panel's finding was not challenged before the Appellate Body.

114 Communication from Canada, *Canada – Renewable Energy/Feed-In Tariff Programme*, WT/DS412/R, WT/DS426/R (June 6, 2014).

115 Panel Reports, *China – Rare Earths*, para. 7.169, WT/DS431/R, WT/DS432/R, WT/DS433/R (March 26, 2014).

the panel stated that the allocations did not seem to relate to the “abundance or scarcity of a given rare earth material,” but instead “seem[ed] to focus on industrial policy concerns, including prior export performance and overall value of exports from China”.¹¹⁶

The key lesson of this decision is that restrictions on exports of raw materials can be permitted in some cases. But when such restraints are imposed in order to promote domestic industrial policy, they are likely to conflict with WTO law unless covered by a relevant exception for measures appropriately targeted at environmental or other policy aims protected under WTO law. Evidence of an illegitimate industrial policy aim may, as in China’s dispute on export bans on rare earths, cause a panel to determine that the government’s measure was in fact not aimed at a legitimate purpose. As some commentators have noted, however, motives are often mixed, and measures aimed at developing and deepening linkages may be seen as producing benefits needed to compensate for the costs of mineral extraction.¹¹⁷ The case of China is described below.

Box 6.1: China’s rare earths dispute from the point of view of Chinese policy-makers

Today, China bears a disproportionate share of the world’s “dirty” mining. With only one-third of global reserves, China supplies 97% of the world’s rare earths. The United States, once the world’s leading producer, shut down all production in 1998, following environmental outcry over a radioactive spill into a California desert. The same story is true of other raw materials such as fluorspar. Other than Spain, no industrialized country mines fluorspar because of the associated environmental hazards, even though both the United States and France have an ample base of reserves.

As China has grown wealthier and its domestic manufacturing base has expanded, its policymakers ask: Why should China aggressively mine an exhaustible natural

resource – and incur the resultant environmental harm – simply to supply the world market, when the rest of the world refuses to do so? Why not limit the use of exhaustible natural resources to its home market, as the United States has done with liquefied natural gas?

For Chinese policymakers, a key factor in analysing the cost-benefit equation at hand is whether the minerals are used domestically or exported. Under both scenarios, the costs are the same: upstream extraction and processing generates negative environmental externalities. However, the offsetting benefits differ greatly, at least in Chinese eyes, depending on whether the mineral is subsequently exported for use by a foreign manufacturer or kept for domestic use.

When kept in China, the downstream Chinese manufacturer later remits taxes back to the Chinese government on profits made from use of the mineral as an input. Although such taxes are not designated for environmental cleanup, they increase the central government’s fiscal capabilities to cover remediation costs. The same is not true of an overseas manufacturer who needs not remit any share of its profits to the Chinese government.

More importantly, the extracted minerals serve as key inputs for several strategic industries, such as defence, high tech, and pharmaceuticals. When kept in China, the inputs presumably increase Chinese capabilities in these sectors and generate positive spillover effects for the rest of the economy (through supply chain linkages, innovation, jobs, etc.). For example, lanthanum extracted from Chinese mines is a key input for Chinese manufacturing of rechargeable car batteries. This, in turn, has sparked the development of an electric car industry in China and innovation in hybrid technologies.

Put crudely, China’s view is that so long as the mineral is consumed within its borders, the positive externalities that emerge from domestic downstream use will more than compensate for the negative externalities that result from upstream extraction. Potentially environmentally harmful acts are acceptable if they trigger greater downstream benefits that will more than cover the remediation costs. However, once the mineral is exported, China fails to capture any positive downstream externalities but is left with the cost of upstream environmental harm. Export restrictions, unlike overall production limits, allow China to account for this difference (Wu and Salzman, 2014).

116 Id. para. 7.484.

117 Not all such measures will give rise to a formal dispute. In inter-state discussions in the WTO’s Committee on Trade-Related Investment Measures, a number of countries such as the United States, Canada, Japan, Australia, and the European Union have similarly raised questions regarding the measures adopted by Indonesia to encourage the domestic processing of minerals, and increase investment (by foreign and domestic companies) in local suppliers of goods and services to the mining industry. These countries have questioned whether the measures are consistent with the TRIMs Agreement, and have asserted that the measures risk discouraging foreign investment in Indonesia. Nevertheless, as of July 30th, 2015, they had not initiated any formal dispute settlement proceedings to challenge Indonesia’s actions. See, e.g., Committee on Trade-Related Investment Measures – Minutes of the Meeting Held on October 8, 2014, paras. 17–43, G/TRIMS/M/37 (November 21, 2014).

Notably, neither the TRIMs Agreement nor the GATT prevents governments from giving subsidies or incentives to domestic *producers* of goods, even if those subsidies or incentives may result in those domestic goods being more competitive than imported goods. Consequently, if a government wishes to increase the EI sector's use of products produced by domestic manufacturers, while also abiding by its obligations under the TRIMs, it should consider granting subsidies or other assistance to domestic companies to help increase their competitiveness as opposed to imposing requirements on or incentivizing EI companies to purchase domestic goods. Similarly, a government wishing to ensure compliance with the TRIMs Agreement should seek to promote beneficitation by granting subsidies to improve the competitiveness of its relevant domestic industries and increase the attractiveness of local beneficitation, as opposed to imposing quotas or other restrictions on exports of raw materials.

As noted below, however, depending on the design and/or the effects of the subsidies, they might violate the SCM Agreement, GATS, or the provisions of international investment treaties.

2. SCM Agreement

While subsidies to domestic producers are allowed under the TRIMs Agreement and the GATT (even though subsidies to *consumers* contingent upon purchase of domestic as opposed to foreign goods are not), some subsidies to domestic producers are restricted under the SCM Agreement. This can limit the policy tools available to governments seeking to increase the competitiveness of their domestic companies, and build and strengthen linkages between those companies and EI projects.

More specifically, subsidies to domestic producers are prohibited under the SCM Agreement if the subsidies are contingent on (1) the use of domestic instead of imported goods or (2) export performance.

If a measure does not fall within one of those two categories of subsidies that are per se prohibited, it will only be barred if there is proof that it causes "adverse effects" to other WTO Member States. In brief, this requires proof that the industry of another Member States has been harmed, or that their benefits under the GATT have been impaired or nullified.

The panel and Appellate Body decisions in *United States – Large Civil Aircraft* help illustrate the implications of these rules for linkage policies. Some measures challenged in that

case were certain collaborative agreements for R&D that the US airplane manufacturer, Boeing, entered into with the US National Aeronautics and Space Administration (NASA) and Department of Defence (DoD). As the WTO panel described, those agreements constituted subsidies that were part of "strategically-focused R&D programmes" undertaken by the government "in collaboration with the U.S. industry to provide competitive advantages to U.S. industry by funding research into high risk, high pay-off research of the sort that individual companies are unlikely to fund on their own".¹¹⁸

Because the R&D agreements were neither contingent on the use of local goods, nor on exports, they were not prohibited per se. Nevertheless, according to the panel, they were inconsistent with the SCM Agreement due to their adverse effects on the interests of other WTO Members. More specifically, the panel stated that the government's R&D incentives aimed at and were effective in overcoming the "large disincentives for private sector investment in long term, high risk [...] R&D (stemming from the inability of individual companies to fully capture the benefits from the research efforts)".¹¹⁹ Those R&D incentives made a "genuine and substantial contribution" to technological development and innovation that, among other effects, enabled Boeing to build better and cheaper products and to do so more quickly than it would have without the subsidy. As a result, the panel concluded, the agreements gave the US company a competitive advantage that caused "adverse effects".¹²⁰

This case helps illustrate that policies that aim to use public-private collaboration to advance R&D and increase domestic competitiveness can violate WTO rules and that the more effective policies are from an industrial policy perspective the more likely it is that they will be deemed inconsistent with the SCM Agreement. Nevertheless, not all such measures will result in a claim or a finding of liability as establishing "adverse effects" in WTO disputes, which necessitates a complex, fact-specific analysis, and can be a difficult and time-consuming element to establish. This, in turn, may discourage governments from initiating formal claims before WTO bodies to challenge subsidies that are not prohibited (export-contingent and import-substitution subsidies).¹²¹

118 Panel Report, *United States—Measures Affecting Trade in Large Civil Aircraft*, para. 7.1764, WT/DS353/R (Mar. 31, 2011).

119 *Ibid.*

120 The panel's findings were later upheld on appeal. Appellate Body Report, *United States—Measures Affecting Trade in Large Civil Aircraft*, paras. 960-1012, WT/DS353/AB/R (Mar. 12, 2012).

121 Under the SCM Agreement, governments that do not wish to initiate a case before the WTO's dispute resolution bodies may in certain cases pursue unilateral actions, imposing "countervailing duties" on products produced by companies that received the subsidy.

3. GATS

While the TRIMs Agreement and SCM Agreement deal with measures relating to trade in goods, the GATS covers measures relating to trade in services. The provisions most relevant to linkage policies are its market access (Article XVI) and national treatment (Article XVII) obligations.

Importantly, the GATS is based on a “positive list” system. This means that countries are only bound to those obligations if and to the extent they have agreed to be committed. If they have not “scheduled” a sector, they can maintain or adopt new measures relating to that sector that would otherwise be inconsistent with GATS provisions. Moreover, when scheduling sectors, they can negotiate for exceptions limiting the scope of the commitments they make.

When, however, a country schedules a sector and subjects it to the national treatment and market access commitments, and does not insist on any relevant exceptions, several important rules can apply that might prohibit the use of various tools aimed at developing and deepening linkages.

- National Treatment:

With respect to the national treatment obligation, which prevents governments from treating foreign service suppliers less favourably than domestic service suppliers, a government might breach this obligation by providing subsidies or other benefits to locally owned and established service companies but not providing those same subsidies or benefits to foreign-owned and domestically established companies.

The national treatment rule can also prevent a WTO Member from implementing measures that favour locally *established* service companies over service companies located in *other* countries if those measures negatively affect the competitive position of those foreign service suppliers.¹²²

Consequently, depending on the national treatment commitments made under the GATS, governments may be limited

in their ability to adopt measures supporting domestic service providers and encouraging EI companies to contract with them if those measures result in the less favourable treatment of foreign-based service providers.¹²³

- Market Access:

The article on market access (Article XVI) prevents members from applying measures that fall into an exhaustive list of six prohibited measures. These are measures that:

- (a) limit the number of service suppliers,
- (b) limit the total value of service transactions or assets,
- (c) limit the total number of service operations or quantity of service output,
- (d) limit the total number of natural persons permitted to be employed,
- (e) restrict or require certain types of legal entities, and
- (f) limit the participation of foreign capital.

For scheduled sectors without reservations, these rules can allow the unrestricted entry of foreign investors into the domestic market, which may crowd out domestic companies and cause them to go out of business. Moreover, Article XVI(e) and (f) can prohibit such measures as joint ventures or domestic equity requirements, tools that governments have used in the past to help promote technology transfer.

4. Summary of Relevant WTO Rules

Overall, the WTO imposes various rules restricting the use of measures that, in the past, have been used – though not always with success – to create linkages between investments in the EI and the domestic economy.

While these restrictions are significant and – according to at least some countries – too stringent, they are weaker in a number of respects than what has been emerging under international investment treaties.

¹²² Panel Report, *Canada—Certain Measures Affecting the Automotive Industry*, paras. 10.291, 10.307–10.308, WT/DS139/R, WT/DS142/R (Feb. 11, 2000).

¹²³ More recently, the panel in *China—Certain Measures Affecting Electronic Payment Services* – came to a similar conclusion, stating:

Furthermore, in the particular circumstances of this case, we do not see how our conclusion on “likeness” of services could be different depending on whether EPS suppliers of other Members supply EPS through mode 1 or through mode 3. Panel Report, *China—Certain Measures Affecting Electronic Payment Services*, 7.704, WT/DS413/R, (July 16, 2012).

Although service suppliers based in different locations can be “like”, the GATS – in footnote 10 to the national treatment provision – also recognizes that the article does not require “any Member to compensate for any inherent competitive disadvantages which result from the foreign character of the relevant services or service suppliers.”

¹²² Panel Report, *Canada—Certain Measures Affecting the Automotive Industry*, paras. 10.291, 10.307–10.308, WT/DS139/R, WT/DS142/R (Feb. 11, 2000).

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Friedrich-Ebert-Allee 36 + 40	Dag-Hammarskjöld-Weg 1-5
53113 Bonn	65760 Eschborn
T +49 228 44 60-0	T +49 61 96 79-0
F +49 228 44 60-17 66	F +49 61 96 79-11 15

E info@giz.de
I www.giz.de

On behalf of



Federal Ministry
for Economic Cooperation
and Development