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RITE2- PHASE 2 REPORT

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Economic Appraisal Case Report RITE2- Phase 2

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This report has been prepared for the Department for International Development by David Shelley, Consultant contracted by Coffey International Development through the Economist and Private Sector Development Services (EPSDS). The views expressed herein are those of the authors and do not necessarily represent the views of EPSDS or DFID.

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ACRONYMS AND ABBREVIATIONS

ASM	Artisanal Mining
BAR	Bilateral Aid Review
BCEOM	French Engineering Consulting Company
CBA	Cost-Benefit Analysis
CDC	Change Data Capture
CDF	Congolese Franc
CDN	Mineral Trading Counters
CEA	Climate Environment Assessment
COMESA	Common Market for Easters and Southern Africa
CSC	Critical Success Criteria
DFID	Department for International Development
DRC	Democratic Republic of Congo
DVDA	Direction des Voies de Desserte Agricole
EDF	European Development Fund
EIRR	Economic Internal Rate of Return
ESIA	Environmental and Social Impact Assessment
EU	European Union
FARDC	Forces Armées de la République Démocratique du Congo
FONER	Fonds National d'Entretien Routier
GBP	Great British Pound
GDP	Gross Domestic Product
GoDRC	Government of Democratic Republic of Congo
IDC	International Development Committee (UK Parliament)
IDP	Internally Displaced Person
IDC	International Development Committee
ISSSS	International Security and Stabilisation Support Strategy
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal

ACRONYMS AND ABBREVIATIONS

MONUSCO	United Nations Organization Stabilization Mission in the Democratic Republic of the Congo
MOU	Memorandum of Understanding
NGO	Non-Governmental Organisation
NMT	Non-Motorised Transport
NPV	Net Present Value
OdR	*Office des Routes*
OP	Operational Plan
PAP	Project Appraisal Period
PK	Point Kilométrique
PNKB	Parc National de Kahuzi-Biega
RITE	Roads In The East
SEMP	Sustainable Environment Management Programme
SME	Small and Medium Size Enterprise
SSU	Stabilization Support Unit
STAREC	Stabilisation and Reconstruction Plan for Eastern DRC
UNAMID	United Nations African Union Mission in Darfur
UNDPKO	United Nations Department for Peacekeeping Operations
UNISFA	United Nations International Strategy for Disaster Reduction
USD	United States Dollar
VFM	Value For Money
VOCS	Vehicle Operating Cost Savings
VPD	Vehicles Per Day

1 INTRODUCTION

The Economic Appraisal Report has been defined in two Phases;

Phase 1 which examined the network of candidate roads proposed for funding in Roads In The East (RITE)2 at a strategic/global level and was submitted in mid-October 2011; and

Phase 2 (this report) submitted at end December 2011, which refines the analyses after important decisions made by DFID on the scale of the investment and after conclusion of a second phase of site visits to Eastern Democratic Republic of Congo (DRC) undertaken during mid-November. This report includes all comments from DFID received up to December 15, 2011.

The Department for International Development (DFID) selected the scale of investment (four routes) and the delivery option (informed by the analysis presented under Phase 1 and other Appraisals). The final refined analysis of the RITE2 program option is included within the Phase 2 report.

The Phase 2 report is divided into two main sections; namely

Main Report: which includes a final refined description of the economic appraisal of the RITE2 program roads as identified in the Strategic Case; and

Annexes including supporting material (including Annex 1 which introduces small refinements to the VFM metrics for the Economics Case component of the RITE2 program).

2 ECONOMIC APPRAISAL OF INVESTMENT IN THE RITE 2 ROADS PROGRAM

The Phase 2 Report includes a final refined description of the economic appraisal as identified in the Strategic Case. All four routes proposed under Phase 1 have been confirmed for Phase 2. The principal refinements in the final appraisal have been five-fold;

a) Significant review of segment costing[1] following extensive site visits and data gathering exercises in Bukavu, Goma and within the road program area;

b) In-depth examination of present and forecast mineral traffic within the influence area;

c) Qualified view of economic benefits during the Stabilisation period;

d) Examination of current research of the economic impact of infrastructure development in post conflict stabilisation environments; and

e) Examination of two other route possibilities within the Influence Area.

The phased route developed strategy which was first elaborated in Phase 1 has been more clearly articulated in Phase 2. The appraisal comprises five parts, as follows:

2.1 Rationale and Intervention Logic

The section outlines the economic case for investment in roads in DRC and the economic rationale for the proposed project. The section reflects on the full intervention logic underpinning the proposed program intervention from an economic and socio-economic perspective.

2.1.1 Context and Need for DFID Intervention

2.1.1.1 Preface

Today, the bulk of DRC's territory is inaccessible. Out of ten provincial capitals, only one is connected by road (Matadi) with the capital city Kinshasa while three are only accessible by river (Mbandaka, Kisangani and Bandundu) and six only by air (Kananga, Mbuji-Mayi, Lubumbashi, Kindu, Goma,

1 Program intervention costs rose 10 percent between Phase 1 and Phase 2, and road program network coverage increased from 519 kms to 648 kms (20 percent).

Kisangani and Bukavu). Communication between these capitals and other provincial centres as well as access to rural areas is often not possible.

Alternative modes of transport are largely unavailable or undeveloped in the project zone. For aviation, air travel costs are high, and for maritime transport- the main river route, the river Congo, is located a long distance from the Area of Influence. The railway network is being rehabilitated under a new large World Bank funded Project. Both main rail lines are located a long way from the project area. Therefore for travel within Eastern Congo, the general population has only the road transport mode available.

Furthermore, the Eastern regions of the DRC are landlocked; Bukavu is situated at the heart of Central Africa. This has implications for economic development within the region since all manufactured goods have to travel over large distances before they reach Eastern Congo. Therefore prices of imports and exports have to bear high transport costs;

2.1.1.2 Roads in DRC

Extremely limited infrastructure in DRC makes access to markets and basic services almost impossible, limiting progress towards many of the Millennium Development Goals (MDG's). DRC has only 2,800 km of largely unconnected paved roads, in a country the size of Western Europe. The paved roads exist largely around the capital and other main cities. The paved road network is 2 percent of the total road network, compared to a sub-Saharan African average of 16 percent.[2]

Most of the main routes and provincial roads are unpaved. Out of a core road network of some 152,400 km, only 36 percent is in fair to good condition. The rest is impassable and in need of reconstruction and/ or rehabilitation.[3]

The Government of DRC has identified 15,800 km of national roads as 'extra high priority'.[4] The high priority roads exclude either provincial or rural roads. Using a conservative figure of USD 40,000 per km as an average cost,[5] investment of USD 6.3 billion would be required to deliver the needed national roads alone.

Although coordination of donor investments in the sector is weak and there is therefore no clear picture of total donor investments, DFID estimates the total to be under USD 3 billion.

The scale of need means that although a number of donors – including China, Japan, Belgium, the Netherlands, Sweden, the World Bank and the European Union (EU) – are active in the roads sector, supply cannot meet demand.

DFID DRC's Bilateral Aid Review (BAR) committed to promoting economic growth and wealth creation and helping build peace, stability and democracy. DID has committed in the BAR and Operational Plan (OP) to improve access to markets and social services along roads rehabilitated and maintained by DFID, and to promote regional trade.

To this end, DFID DRC agreed to provide up to GBP 47m of new finance to the roads sector from 2011 to 2015. The scale of investment that DFID can offer can have a significant impact given the significant funding gap DRC currently faces. It is also focussed in an important area which:

- Is landlocked, largely separately from the rest of the Country but with important regional connections to Rwanda, Burundi, Uganda, etc.
- Has suffered enormous social unrest following periods of war and insurgency which has meant that all of the existing main (provincial) roads have fallen into disrepair and become impassable; and

2 *Develop infrastructure to develop Africa*, James Kathuri, The African Executive, August 2010: www.africanexecutive.com/modules/magazine/articles.php?article=173

3 World Bank Project Appraisal Document, Multi-modal Transport Project, June 2010

4 Documented in, for example, the minutes of the first Groupe Thématique d'Infrastructures et Transport- meeting in June 2011, EDRM 3078079.

5 The World Bank/DFID ProRoutes programme supports the national priority roads programme. Costs/km were re-evaluated two years into the project and revised upwards to USD44,000/km counting works and maintenance alone, or USD68,000/km including all supporting activities such as institutional capacity building and environmental management. EDRM 3041461

- Is an area already well-known to DFID in RITE1, hence forward programs may build upon an established institutional base.

2.1.1.3 Roads in Eastern DRC

Conflict persists in eastern DRC, and the rehabilitation and passability of key routes is a key strategic element of the stabilisation effort. The isolation of populations in the East exposes people to major security and human rights risks, while the reconnecting of these populations to security services, basic services and economic opportunities is among the highest priorities of the Government of DRC and the United Nations Organization Stabilization Mission in the Democratic Republic of the Congo (MONUSCO).

In 2008 the Government/MONUSCO Stabilisation and Reconstruction Plan for Eastern DRC (STAREC) (now the International Security and Stabilisation Support Strategy – ISSSS) identified six strategic axes in North and South Kivu that are critical to stabilisation. The ISSSS has recently been reviewed to identify the priorities for 2011/12.[6] The revised plan identifies two further priority roads in addition to those in the original stabilisation plan.[7] In eastern DRC, a number of donors have supported the ISSSS plan. Nevertheless, there are funding gaps for the delivery of the original ISSSS plan, and funding has not been secured for the two priority roads identified in the revised plan.

Sustainable road maintenance is an essential part of investment in the sector in DRC, and especially in the heavily forested east of the country. The environment is such that roads can deteriorate rapidly – in as little as one year – if they are not maintained on an ongoing basis. DFID's experience with the Kisangani - Ubundu road, which had to be rehabilitated a second time as there was no long-term maintenance system in place, is an example of the specific challenges of working in the roads sector in the DRC context. Additional problems are overloading of vehicles, which leads to rapid destruction of unpaved roads and the reluctance to observe the requirements of rain barriers which leads to increased damage to roads, since run-off is not permitted to take place before vehicles travel along the roads.

Yet the literature suggests that USD 1 of investment in maintenance in sub-Saharan Africa can save USD 4 of spending to rehabilitate roads that have deteriorated.[8]

2.1.1.4 Justification for DFID Intervention

DFID is well-placed to deliver impact in the roads sector. DFID already has a broad portfolio of roads programmes and projects. DFID supports the national roads strategy through a World Bank/DFID multi-donor trust fund, ProRoutes, which will build or upgrade 1,800 km of 'extra high priority' roads by 2016. DFID has also recently finished projects to build/upgrade rural roads and a priority road from Kisangani to Ubundu.

The first phase of the project 'Roads in the East of DRC' began in 2009 in support of the stabilisation plan for eastern DRC. Of the six axes identified in the stabilisation plan, DFID funded the build/upgrade of the Burhale-Shabunda road as well as the maintenance of the other axes. This existing intervention in eastern DRC makes scaling up feasible, since DFID has already established relationships with relevant partners and laid the groundwork for a second phase. Moreover, the Roads in the East project is progressing well. The impact has already been significant, with the Burhale-Shabunda road reopened for the first time in over 20 years, reconnecting Shabunda to goods and services. Traffic numbers and cargo volumes are already increasing significantly: the number of vehicles per day has increased from one to 42, and the daily freight in tonnes has increased from zero to 28 tonnes per day at the Burhale end.

A number of projects funded in DRC in general and under the ISSSS plan in particular have not yet set up effective and sustainable maintenance systems, meaning that the results achieved to date are

6 ISSSS/STAREC Priority Plans 2011–2012 (EDRM 3035607)

7 The two new roads that have been identified are Nyamirera-Walikale, joining South and North Kivu, and Nyabiondo-Walikale in North Kivu.

8 Agence Française de Développement/World Bank, *Africa's Infrastructure: A Time for Transformation,* siteresources.worldbank.org/INT**AFRICA**/.../aicd_overview_english_no-embargo.pdf

at risk. DFID is leading the field in building the capacity of government to put a sustainable maintenance system in place to ensure that the development and poverty reduction benefits of roads are not undermined. This is a key output of DFID's Roads in the East programme, through which DFID has gained agreement for the first time in DRC that the national roads fund will finance the maintenance of priority provincial roads and the provincial department of *Office des Routes* will implement the maintenance programme using local SME's and labour.

2.1.1.5 Rationale for Further Investment in Roads in Eastern DRC

In line with the context and justification set out above, DFID DRC wishes to extend its investment in roads in the east of DRC. This includes the upgrading the Burhale–Shabunda road that was funded in RITE 1, funding two new roads identified in the ISSSS plan for 2011/12, and building a bypass around a national park that would otherwise be impacted by one of the two new roads identified in the ISSSS plan. DFID could provide further financing for the RITE2 Program.

This investment would allow DFID to:

Deliver up to 628 km of roads built or upgraded (as indicated in first Map in Annex 2), and deliver an increase in the weight of goods transported along DFID-funded roads. These results would deliver against the BAR:

- Double the weight of goods transported along DFID-funded roads.[9]
- Deliver broader development and stabilisation outcomes, including access to basic services and economic opportunities. These will include, for example, reducing the costs of household goods: the current Roads in the East project has reduced the cost of petrol from CDF 3,000 to CDF 2,000 per litre, and the cost of 1kg of salt from CDF 2,000 to CDF 1,600. This investment will also create employment (the current project will create 300,000 employment days), including for women (who DFID will ensure make up 30 percent of the workforce).
- Ensure the sustainability of a maintenance system for provincial roads that will provide lessons for elsewhere.
- Provide an enabling environment to assist progressive stabilisation of North and South Kivu and to support the legitimisation of artisanal mining.

The consequences of not intervening would include:

- Slowing progress towards DFID DRC's BAR and OP commitments to invest further in the roads sector. DFID would need to find alternative investments to build or upgrade 628 km of roads. DFID currently has no other project in place that could mobilise sufficiently quickly to deliver the large number of kms that remain to be programmed out of the OP commitment of 1,700km and failing to capitalise on DFID's existing engagement in eastern DRC would jeopardise achievement of the OP commitments.
- Insufficient donor funding to meet the priority needs set out in the stabilisation plan for eastern DRC. MONUSCO have identified the need for a further GBP 8.5 million to deliver key new priorities in the roads sector.
- Failure to ensure the long-term management of the environmental and social impacts of the road DFID has funded to re-open, potentially leading to negative results such as an increase in the production and trade of charcoal and bushmeat.
- Significant delays in stabilisation and the slower economic and socio-economic development of North and South Kivu.

2.1.1.6 Evidence

There is strong evidence from several very recent World Bank funded Studies that fully support DfID's interventions in the roads sector in Eastern DRC; including:

9 Progress report for Roads in the East April 2011 (EDRM 3106045)

- *The Democratic Republic of Congo's Infrastructure: A Continental Perspective*, March 2010. [This study is a product of the Africa Infrastructure Country Diagnostic (AICD), a project funded by the World Bank]; and
- *Diagnostic Trade Integration Study* prepared by the World Bank Poverty Reduction and Economic Management Department 3 Africa Region, July 2010.

The first Study noted: DRC's total infrastructure spending requirement is high in absolute terms and even more so relative to Gross Domestic Product (GDP). At close to USD 5.2 billion, in absolute terms, *the spending need for infrastructure is among the highest in Africa*. Relative to the size of the DRC's economy, the spending amounts to a staggering 75 percent of 2006 GDP. This is by far the highest burden of infrastructure spending for any African country, and is substantially higher than the average of low-income, fragile states. Investment alone would absorb around 57 percent of GDP, which is several times higher than China's record-high levels of infrastructure investment (15 percent of GDP during the mid-2000s).

The second Study noted: The geographical features of the Eastern region, its proximity to the Common Market for Easters and Southern Africa (COMESA) countries and the political background over the past 20 years have greatly affected the way business is done. The economic, social and cultural, and especially agricultural environment has an impact on the market and local trade practices. Within Eastern DRC there are noticeable differences. Border delays for customs clearance at the port of entry in DRC vary all along the border with Uganda, Rwanda, Burundi and Tanzania. It often takes 2 or 4 days in Goma and Bukavu. Trucks rarely stay long in the DRC because the availability of return freight is very limited. Only 1,000 tonnes of coffee is available for export Goma Region and a few batches of cinchona and tea are annually exported from Bukavu. Road transportation remains burdensome. The freight rate for exporting 10,000 tonnes of foodstuffs in bags, is similar to the Durban/Lubumbashi rate of USD220 at 225/t. The multiplier from the FOB rate to the landed rate in the East is estimated at 4, like in the South. External supply markets can be very close (Kenya, Uganda, Rwanda, and Burundi). But the pre-shipment inspection procedures recommended by the authorities are too long, 15-21 days, to develop efficient local trade. The journey between those countries and the consumer cities in Eastern DRC takes 3 to 5 days. The average customs clearance time on truck after crossing the border is estimated at 4 and 7 days for exports.

These key recent Studies stress the critical benefits of road network development and improved customs arrangements in DRC for both economic and socio economic reasons (the latter including poverty reduction).

The economic benefits are likely to include, over a period of time, a re-establishment of pre-conflict traffic volumes (induced passenger traffic and cargo volumes) and reduced costs of transported goods and commodities within the roads program influence area. The socio-economic benefits are likely to include the progressive re-establishment of local governance and province –wide improvements in the security situation.

DFID's investments in roads programmes in DRC support these findings. The first phase of DFID's Roads in the East project, for example, shows an increase in traffic and cargo volume and a decrease in the cost of household goods, as indicated above, albeit from a low base.

There is extremely limited coverage in the literature on the degree to which the re-establishment of important provincial roads in post conflict situations can facilitate improved economic development. (Further research is required to assess the impact of improved governance, improved local operations of Non-Governmental Organisations (NGOs) and improved security brought out by major road development programs on regional economic development *in post- conflict situations*).

While this has been one of the foci of DFID's roads programmes in eastern DRC, the qualitative nature of the data on the presence of NGOs, and limitations in the capacity of partners to collect reliable data, mean that DFID does not have a clear picture of the degree to which rehabilitated or reconstructed roads are leading to an increase in access to basic services.

Anecdotally, however, the recently re-opened roads from Kisangani to Ubundu and Burhale to Shabunda have both seen an increase in NGO activity. DFID will continue to collect data in this area. The Stabilisation Support Unit in MONUSCO will also need to expand its Baseline monitoring system to measure local governance improvements, to measure the gradual reduction of security costs and to measure socio-economic benefits associated with improved education and health care.

The social and economic impacts of improved road access, for which the evidence set out above is strong, as well as employment opportunities which roads projects can offer during construction and maintenance, which may also greatly facilitate community recovery.

Community recovery, in turn, is a core element of any stabilisation effort. The MONUSCO UN Support for Security and Stabilisation of Eastern DRC background briefing and roll-out plan frame the stabilisation effort around three axes: improved security, political inclusion and improved livelihoods or community recovery.[10]

MONUSCO has stated that "there is no faster way to kick-start recovery than repairing roads."

As a result of conflict and failure to maintain the roads that existed before the war, many "rural areas are completely isolated and armed groups in the east have been able to move unhindered, populations have been cut-off and commerce has all but disappeared… Rebuilding roads and creating jobs in the process, expanding the transport grid and clearing corridors of checkpoints will not only destroy key profit centres of the remaining armed groups, these actions will also accelerate the economic reunification of the east, return markets to their past vibrancy and permit people to move freely."[11]

Even more important is the need to re-open key provincial routes. There is a need to (re)-connect important regional centres such as Shabunda and Walikale to provincial centres such as Bukavu and Goma. This requires an approach which considers area development (improvement *over whole routes);* an important feature of the RITE2 program.

MONUSCO's 'roll-out plan' identifies lack of economic development for returning populations as a driver of malnutrition, mortality and ethnic tensions which in turn could lead to entry into armed groups. Further, "with 80 percent of the population dependent on agriculture, boosting production, opening transport routes, purchasing food locally, and providing limited food aid are the fastest, most efficient ways to increase household incomes in return areas".[12]

An emerging area of importance has been artisanal mining. The zone of influence contains important rare and expensive minerals whose development will be accelerated through provision of an improved network of provincial roads. Mining sector development includes the export of rare minerals, the ingress of workers and mine supplies and the establishment of *centres de négoces*. These centres are being constructed where the products of certified legitimate (conflict-free) mines within a 20 to 30 km radius can be sold on for export and tax collected. Four *centres de négoces* have been built so far: at Itebero, Isanga, Rubaya and Mugogo, whilst a fifth centre is to be built at Numbi.

DFID will seek to build quantifiable evidence on the links between roads investments and stabilisation and mine sector development. This is an important secondary objective which could in turn feed into the global body of evidence in this field.

2.1.1.7 Summary

Important recent World Bank reports for DRC stress the overarching need to invest in infrastructure (particularly in the power and roads sectors) and also that for some - perhaps many - years these investments will be donor supported since the economy will not be able to generate sufficient funds to develop the infrastructure required for economic growth.

10 MONUSCO, UN Support for Security and Stabilisation of Eastern DRC Background Briefing, (EDRM 3091507) and Roll-out Plan (EDRM 3091548)
11 MONUSCO, UN Support for Security and Stabilisation of Eastern DRC Background Briefing, (EDRM 3091507)
12 MONUSCO, UN Support for Security and Stabilisation of Eastern DRC Roll-out Plan (EDRM 3091548)

Support to rehabilitate and re-open key provincial routes in Eastern DRC clearly fits very closely with this important identified need identified by the World Bank for many reasons including population density, fertile soils plus the devastated social and security situation.

The Commission for Africa 2005 report recommended that *Donors should double spending on infrastructure*. This reflects a wider move by Donors towards increasing support to the productive sectors notably stimulating economic growth. The IDC[13] noted that Transport infrastructure has a major role to play in achieving the MDG's and is fundamental to security, prosperity and development. Road infrastructure in particular can boost regional trade and integration by carrying raw materials, labour and manufactured products and can enable people to reach health and education services.

Since the road density is very low, without the rehabilitation of the sparse network of provincial routes (a Do Nothing Scenario) not only will stabilisation take much longer to achieve but also economic (re)-development be substantially slower in this part of Eastern DRC.

The benefits of provincial road rehabilitation to Society during the Stabilisation phase are largely socio-economic, bolstering the security and governance initiatives of the stabilisation program but in time it is expected that economic benefits will grow, through cash cropping and so on. It is expected that improved road access to the CDN's under construction in the Study Area will help support the development of traceable supply chains that comply with due diligence requirements and which could help swing the balance more in favour of legitimate trade. An increase in the value per kg of tin and coltan, as they becomes acceptable again on international markets, could have a significantly positive impact on the regional economy associated with the legitimisation of artisanal mining.

2.2 Cost Benefit Analysis (CBA)

2.2.1 Introduction and Literature Review

A detailed Literature Review was undertaken during the *Desk Review* period. Several important documents were also provided and acquired after the submission of the Desk Review Report. The EA has been contracted as a homebase assignment14. It has therefore relied on the detailed fieldwork undertaken by other members of the DFID team for the regional data inputs and for guidance.

A cost-benefit analysis to develop estimated economic rates of return for the proposed roads was undertaken in Phase 1 and is refined in Phase 2, following receipt of new data, information and guidance from DFID.

Table 1 ITE2 Program Route lengths within the Kivus

Route No	Main Route segment Name	Province	Length kms	Length Kms North Kivu	Length Kms South Kivu
1	Nyamirera- Walikale	North Kivu (part South Kivu)	128	107	21
2	Kaseke- Bunyakiri	South Kivu	72		72
3	Burhale-Isezya- Shabunda	South Kivu	239		239
4	Sake- Nyabiondo- Walikale	North Kivu	189	189	
			628	**296**	**332**
				47%	53%

Source: Consultants Field Surveys

The route improvement by Province is included within Table 1. Some 53 percent of the program is located in South Kivu Province at around 332kms of road improvement.

13 DFID's role in Building Infrastructure in Developing Countries- UK Parliament International Development Committee

14 Funding was available for twelve working days.

Route 1 Nyamirera- Walikale is presently impassable to motorised traffic for some 69 km of that route. The Kaseke- Bunyakiri and the Sake-Nyabiondo-Walikale routes are presently impassable and the remaining Burhale- Shabunda route has periods of temporary impassability during heavy rainfall. There is a need to re-establish DRC's road network infrastructure as a pre-condition for further economic growth.

2.2.2 Proposed Road Network Development Approach

Roads program investment will only be effective if carried out in the context of a sensible area development strategy. Roads are only really valuable to the extent they add value to other activities linked to roads. Roads derive much of their value from their contributions to the values of other assets, such as schools, hospitals, clinics and business concentrations that they make possible and then these assets in turn feed wealth creating productivity. Therefore the road development policy adopted for RITE2 should form part of a holistic *area* development strategy.

Whilst detailed regional development plans do not appear to have been formulated, the following three-phase development strategy has been proposed by MONUSCO:

- Opening up of an area to stabilize the rehabilitation of the roads under consideration; DFID funded, (*with military operations for security in parallel*: MONUSCO, FARDC);
- Deployment of the 'authority of the state' and activities of economic recovery *when the security situation allows*, ideally the timeline is 2-3 years; and
- Then projects as part of program development as the European Development Fund (EDF) and World Bank should be able to take over, including long-term work on the roads initially re-opened (preferably through paving and longer –term investments in provision of retaining walls and permanent bridge structures).

MONUSCO noted further that in terms of development approach, it is important for the UN to encourage the EU and the World Bank to design projects that will take over the initial stabilisation efforts to sustain the investments, especially some two or three years after initial investments have been made (for phase 3 above). In the UN's view, given the current situation in the Kivus, unless the stabilization program in Walikale is developed, the EU will never be able to implement its road network development program, as the minimum security and stability arrangements will not have been put in place.

'*The two development stages are complementary, and the first is a sine qua non for the implementation of the second. The fact that the EU is considering stage 2 investments in the Goma-Walikale route in the FED is a priori a good strategy, since it will provide the UN with an assurance that the initial efforts (and investments) can be sustained'.*.

Improved security will assist to improve the stabilisation program in the post conflict situation, so that the rural population can re-engage in economic and agricultural activities and can have better access to health and education facilities, etc. It is noted that there is some uncertainty over the future period of MONUSCO operations in Eastern DRC.

2.2.3 CBA Assumptions utilised

The applicable Discount rate will be 12 percent. The assumed Project Appraisal Period (PAP) is 10 years after construction, which is common for this type of low volume road appraisal. A three year construction period is assumed due to the distances from the provincial centres and the need for security arrangements during construction. Minor residual values have been assumed.

2.3 Costs

Costs have been derived for road construction and maintenance, as indicated below.

2.3.1 Construction costs

An assessment of route construction costs is provided in Table 2 below. The costs have been derived following an exercise to determine segment costs for each route in conjunction with DFID's Engineering consultant. A program cost of some USD 19.00 million was derived based on the network

defined in the ToR. A Phase 1 program cost of some USD 22.9 million was derived based on the network defined in the ToR plus the additional Link 2 Kaseke- Bunyakiri which provides a bypass route for the Parc National de Kahuzi-Biega (PNKB).

In Phase 2, as a result of further fieldwork, the estimated program cost rose to USD 24.53 million[15] in line with an increase in program size from 519 km to 628 kms.

Table 2 Estimates of Construction Costs and Assessed Traffic Volumes

Route No	Main Route segment Name	Length kms	Financial Costs US$ Million	% of Program	Assessed Present Motorised Traffic Volumes vpd
1	Nyamirera- Walikale	128	5.25	21%	impassable
2	Kaseke- Bunyakiri	72	3.87	16%	impassable
3	Burhale-Isezya- Shabunda	239	8.48	35%	2
4	Sake- Nyabiondo- Walikale	189	6.93	28%	impassable wet season
		628	**24.53**		

Source: Engineering and Field Estimates

Table 2 shows that base year traffic for all links is minimal with the exception of a small part (at the Burhale end) of the improved Burhale- Shabunda route.

The incremental costs associated with the interventions are provided, varying by the scale of the investment. Further details of intervention cost per Route and Segment are provided in Table 3 below. The estimated unit costs envisage building or upgrading the roads to a standard at which they are passable at an average of 40 kph by 4x2 vehicles. The costs are based on topography, environment and the number of bridges in each road segment.

The unit costs are provided in table 3 and average some USD 41,000 per km across all routes. Total Program Financial cost is USD 24,530,000.

15 The increase in the total program cost estimates between Phase 1 and Phase 2, as further field research has been undertaken in late 2011, indicates a potential program risk should costs rise further during implementation. This risk is included in the section on sensitivity testing.

Table 3 Route and Scheme Cost per Segment

Route Miti- Walikale	From	To	Length Kms	cost '000 US$/Km	cost '000 US$
	Nyamirera	**Walikale**			
	Miti	Nyamirera	69	0	0
	Nyamirera	Hombo	21	10	210
	Hombo	Otobora	14	40	560
Segment:	Otobora	Musenge	27	40	1080
	Musenge	Itebero	28	80	2240
	Itebero	Nyasi	26	40	1040
	Nyasi	Walikale	12	10	120
	Total route:		128	36.667	**5250**
Route Kaseke to Bunyakiri	**From**	**To**	**Length Kms**	**cost '000 US$/Km**	**cost '000 US$**
	Kaseke	**Bunyakiri**			
	Kaseke	Bogamanda	13	40	520
	Bogamanda	Katasomwa	14	70	980
Segment:	Katasomwa	Mbindano	19	70	1330
	Mbindano	Kichanga (Bunyakiri)	26	40	1040
	Total route:		72	55.000	**3870**
Route: Burhale- Shabunda	**From**	**To**	**Length Kms**	**cost '000 US$/Km**	**cost '000 US$**
	Burhale	**Shabunda**			
	Burhale	Lubimbe 2	65	0	0
	Lubimbe 2	Isezya	31	35	1085
Segment:	Isezya	Byangama	99	40	3960
	Byangama	Katchungu	47	40	1880
	Katchungu	Shabunda	62	25	1550
	Total route:		239	35.000	**8475**
Route: Nyabiondo-Walikale	**From**	**To**	**Length Kms**	**cost '000 US$/Km**	**cost '000 US$**
	Sake	Walikale			
	Sake	PK 29	29	15	435
	PK 29	Masisi	27	25	675
	Masisi	Nyabiondo	22	30	660
Segment:	Nyabiondo	Kibati	24	70	1680
	Kibati	Kibua	29	40	1160
	Kibua	Mpofi	16	40	640
	Mpofi	Mutakato	24	40	960
	Mutakato	Walikale	18	40	720
	Total route:		189	37.500	**6930**
	Total all routes		**628**	41.042	**24525**

Source: Consultants estimates

2.3.2 Proposed Route Improvements

The project will build/upgrade and maintain the following routes to a standard at which they are passable by 4x2 vehicles at a speed of 40 kph. The objective is to open the routes along their entire length and then to stabilise weak spots without building a fully engineered earth road.

- Burhale-Shabunda (304 km). This provincial road was reopened to 4x4 access during the first phase of the project "Roads in the East" (2009-2012). The first 96 km from Burhale to Isezya were due to be upgraded with EU funding for 4x2 access. While 65 km of this work went ahead, EU finance ran out in September 2011 and 31 km from Lubimbe 2 to Isezya remains to be completed.
- Nyamirera-Walikale (128 km). This national road is part of the Bukavu-Walikale route (236 km). The Bukavu-Nyamirera section (106 km) crosses the PNKB national park and has been reopened and stabilised recently and is being maintained. On the section Nyamirera-Musenge (62 km) the Uruguayan MONUSCO brigade will reopen the section by early 2012 before DFID finances further upgrading work. The section Musenge-Itebero (28 km) has been closed for all traffic except motorcycles for the past 10 years. Work is being undertaken on the section Itebero Nyasi (26 km) by the NGO Caritas, who will shift their focus to rural roads if DFID finance begins. The section Nyasi-Walikale was reopened in 2007 and is under maintenance.
- Kasheke-Bunyakiri (72 km). This rural road will be a by-pass road allowing vehicles coming from Walikale and going to Bukavu to avoid the PNKB. The middle section of the route exists only as a footpath and will require full new construction. The rest of the road requires upgrading.
- Sake-Walikale (190 km). The first 29 km from Sake were recently re-opened with EU finance and require minor upgrading work. Kilometre 29 to Masisi (27 km) has been worked on with EU finance. However, the finance ran out in September 2011 and this section has only a prepared platform, which has not been compacted and which has no drainage. The section Nyabiondo-Walikale (111 km) was reopened by an NGO (AAA) in 2005-2007 but is almost impassable during the rainy season and requires significant upgrading.
- The provincial routes will be opened along their entire lengths, thereby permitting all-weather access for key Security and GoDRC Traffics. The improved access would permit the supply and servicing of local police stations and other government facilities and would help facilitate an improvement in socio-economic activity within the influence area. Improved access should assist the functioning of the newly established *centres de négoces* (CDN's) and help to support other rural development activities, perhaps led by NGO's.

2.3.3 Alternative Route Proposals for a stretch of the Walikale-Masisi route

A 1985 study for the road proposed two other routes – Bihambwe – Kiningi - Musenge and Bihambwe – Kiningi – Walikale. Kiningi lies due west of Bihambwe (Second Map in Annex 2). These two alternatives were proposed some 26 years ago and are not currently regarded as feasible because:

- The new construction of these roads would be very expensive;
- Government would not accept an alternative route which does connect Masisi (the chef lieu administratif du territoire);
- Most local inhabitants live along the current Masisi - Walikale road route; and
- The new route would potentially only benefit large farmers in this area.

The northerly link that is proposed to run south of Masisi and to connect north of Walikale already has the parallel route between Masisi and Walikale which is not much shorter. There is therefore no reason to build a very high cost alternative route along this new alignment. The southerly link that is proposed to run south of Masisi and to connect east of Itebero (south of Walikale) would be a much shorter link. There are no other route options between these two locations. The construction of this second East-West link would not effect the main North South route improvements to be funded under RITE2. This second link might be an option for funding, sometime in future but it would be high cost,

hence is unlikely to be feasible. It is therefore very unlikely that in future, the proposed EU Technical Study for sealing the Masisi- Walikale route would select either one of these alternative routes as a viable option. It is understood that the technical study will take at least a year to complete. The EU has indicated it is unlikely to have significant further funding for infrastructure before 2015.

2.3.4 Design Parameters Assumed

A guiding principle in the provision of roads should be that the engineering standard of a road should be determined by the type and volume of traffic that is expected to use the infrastructure. Infrastructure that is over-designed is not only more expensive than necessary to build but also is more expensive to maintain. There is a tendency to promote standards in Africa that are too high for low volume transport infrastructure. A phased development is proposed in line with the actual build-up of traffic. Most of the roads were originally designed and built for single lane traffic. The program will keep to this standard, but for safety reasons roads will be widened to 7m every km and in areas of restricted visibility like bends and slopes to allow trucks to pass each other. These standards will be applied to all roads covered by the program, except in urban areas and for the crossing of villages where wider standards will be used where possible. In many places roads are cut into the side of mountains and in these areas the location of passing points will be dictated by the topography. The World Bank provided guidelines for Road Surface and Traffic. Earth standard may accommodate 0-50 VPD (Table 4). It is noted that the proposed interventions are *not* fully engineered earth roads and that, at least in the early stages, less than 50 VPD would be expected. The target traffic level for the Phase 1 is less than 50 VPD (4WD traffic) across all four routes.

Table 4 Road Surface/Traffic Compatibility Estimates

Road surface standard	Number of vehicles suitable per day
Earth	0 to 50
Gravel	20 to 500
Bitumen	Over 500

Source: World Bank, 2003

The World Bank also provided guidelines for Road Width and Traffic. It is noted that the proposed interventions are assume a single lane width with a minimum width of road required for single track traffic of 3m. Occasional passing places every one km will be at 7m width).

Table 5 Road Width/ Traffic Compability Estimates

Width of road (in metres)	Type and Level of Traffic
1- 2	Suitable for footpaths and routes for bicycles
2 - 5	Minimum width for a track with non-motorized transport (NMT) such as animal carts, occasional motor vehicles
3	Minimum width for a single track road with passing places, suitable for low volumes of traffic
4.5 - 6	Narrow, roads permitting two-way traffic, suitable for small rural roads with less than 100 vehicles per day (average)
> 6	Two-way roads permitting large vehicles to pass comfortably, and with more than 100 vehicles per day (average)

Sources: World Bank, 2003

A 5 ton axle load limit has been assumed for all four routes. This has important implications (restrictions) on choice of freight transport vehicle and the future costs of road transport.

2.3.5 Maintenance Costs

For the purposes of the Economic Appraisal and in line with convention, annual maintenance costs have been assumed as a small proportion of the Capex over the project appraisal period. It is presently expected that a lengthman will be employed every km to undertake clearance of drains and minor pothole repairs. For more capital intensive works, some basic equipment will be procured.

2.3.6 Delivery Mechanisms

The project will also continue supporting the maintenance of the other strategic roads identified by MONUSCO, as in RITE. Maintenance will be funded by FONER and executed by OdR. The routine maintenance will be based on a lengthman system; payments will be linked to the service level of the road. As in the first phase, the program will contract out sections of the road to local Small and Medium Size Enterprises (SME's) of about 5km each. These SME's will be trained in cooperation with the Direction des Voies de Desserte Agricole (DVDA) in labour based methods. These SME's will then qualify to bid for tenders. During the first phase of the project DFID found this to be a very effective way of developing local private sector capacity.

The program will proactively seek to employ demobilised soldiers and women. It will also work to strengthen local private sector capacity.

The program will purchase some basic equipment, such as small vibrating soil compactors, which will then be leased to successful SME's. Such equipment is hard to come by in South Kivu and can often be a constraint to a successful bid. This approach has been used on the rural roads project in Kasai Oriental that DFID has funded and proved an important strategy to unlocking private sector involvement in the project. This approach has also been used during the first phase of the RITE. Although this equipment is still available more will be needed, because of the increased volume of works.

2.3.7 Residual Value

Conventionally a minor percentage of the initial Capex is 'added back in' at the end of the Project Appraisal Period, to reflect the residual value of the investments remaining at the end of the period.

2.4 Traffic Assessment

2.4.1 Historical Traffic Volumes

Traffic analyses were conducted for Route Nos. 1 and 4 through examining the original provincial traffic counts recorded in the 1990 BCEOM Study. This appears to have been the most comprehensive traffic and economic appraisal study conducted to date and which spans the complete DRC road network, although focussing on primary and secondary routes. These traffic counts provide an important reference point, since when these traffic volumes were enumerated the main inter provincial links were indicated as being passable. No traffic was recorded, in 1990, for Link 2 (Kaseke- Bunyakiri) or for Link 3 (Burhale- Shabunda.

The 1990 BCEOM study recorded traffic volumes on the Route 1 Nyamirera- Walikale some twenty years ago, in a pre-conflict environment. Some 40 vehicles per day (VPD) were enumerated between Miti and Hombo and some 50 VPD were recorded between Hombo and Walikale. The condition of the Miti- Hombo segment was recorded as 'medium' and the condition of the Hombo- Walikale segment was recorded as 'poor'.

It could be reasonably assumed that road traffic will return to at least 1990 levels within five years of re-opening the Miti to Walikale section (e.g. to about 50 VPD). The RITE2 program design standard is for less than 50 VPD for all segments.

The 1990 BCEOM Study also recorded traffic volumes on the Route 4 Masisi- Sake, some twenty years ago. In the vicinity of Sake some 60 VPD were enumerated; the traffic count increasing towards Goma, where 145 VPD were enumerated.

It could be reasonably assumed that road traffic would return to at least 1990 levels between Walikale and Sake (50 VPD) within five years after this provincial road has been fully re-opened.

2.4.2 Traffic Categories

Motorised Traffic is usually categorised into three groups:

- Normal Traffic;
- [Future] Diverted Traffic; and
- [Future] Generated (or Induced) Traffic.
- Normal Traffic Concept: this refers to existing motorised traffic already using the road network and is known as 'Normal Traffic'. (Note: normal base year traffic is zero for three routes and minimal for the Burhale-Shabunda route).

2.4.3 Present Traffic Volumes

As noted in section 2.2.1 present day motorised traffic volumes in the Zone of Influence are extremely low due to the depressed economic and social conditions and the *impassability* of the key provincial routes. The existing very low traffic volumes translate into both low present public transport passenger demand and low present volumes of commodities carried.

Table 2 indicates assessed present levels of motorised traffic on the roads under consideration. In the majority of cases motorised traffic is almost non-existent or very low. Links such as the Burhale – Shabunda route have some impassability during wet periods however the other links are impassable to all but bicycle traffic along some portions and there is consequently no through traffic.

Burhale – Shabunda (B-S) route: DFID has provided Stage 1 investments on the Burhale – Shabunda route. The post intervention traffic is known to be about 60 VPD around the (more heavily) populated end point at Burhale, however through traffic or mid point traffic is probably very low- perhaps in the order of 2 VPD only during dry periods.

Other 3 Routes: for the other 3 routes there is no *Normal* traffic. Most of the provincial roads are impassable, which means there is no 'public transport'; either Matatu's or the 4-wd pick-up 'bus' type vehicles presently operating along on these routes which are prevalent elsewhere in Africa.

2.4.4 Current Transport Costs

On the impassable road sections, transport is carried out by Non-Motorised Transport (NMT) means (freight bicycles) at punitive cost and hence the transport of goods is depressed. The numbers of such bicycles is not known but is not expected to be very high due to the very long distances between provincial centres. Some Palm oil traffic is reportedly transported by freight bicycle although since volumes are low this is presumably destined for local use.

Current transport costs on the improved (re-opened) route between Burhale and Shabunda are coming down as traders take advantage of all-weather access and utilise motorised transport (4WD/pick-ups) for transport of marketable goods. Future VOC's to be recorded post-intervention are expected to be quite different from todays, and could for instance also include new motorised vehicle types.[16]

2.4.5 Traffic Forecasts

The provision of low volume roads in developing countries in Africa has created some particular evaluation challenges. In rural settings, where initial traffic volumes are very low there is a problem of traffic estimation.[17] Secondly, where there is a high proportion of non-motorised traffic, such as freight and passenger bicycles, post project benefit estimates can be awkward to assess.

Normal Traffic Concept: since only one route has normal base year traffic, even if a relatively high traffic growth rate, for instance of 5 per cent per annum, were to be applied for the Burhale-Shabunda route, future normal traffic levels there would still remain low.

16 Therefore no target transport costs have been defined.
17 Case Study in Natal Province, South Africa, S. Muradzika, School of Economics, University of Cape Town.

Diverted Traffic Concept: Assignment of diverted traffic would be based upon the attractiveness of each alternative route in the road network. Normally alternative routes are existing transport facilities with normal traffic volumes. Since there is only minimal normal traffic on the Burhale- Shabunda road and no alternative route, the volume of diverted traffic will be zero.

Generated Traffic Concept: This is traffic arising either because a journey becomes more attractive due to a cost or time reduction, or because of increased development that is brought about by road investments. Induced traffic is traffic that is entirely new and has never existed before. It is brought about by an area becoming more accessible. Studies have shown that the extent of induced traffic depends mainly upon the availability and size of easily exploitable resources. This component of traffic is likely to be small, given that non-motorised traffic volumes are low and because, beyond ASM, there are few other easily exploitable resources within the program area. However, it is likely that some vehicles will be induced to use the routes more frequently once they are improved; particularly as Government and Donor funded projects are commenced, or as some existing traffic moves from aviation mode (helicopter and small planes) to road mode.

Although existing traffic is low, in future traffic could be generated by the Mining, Logging and Agricultural sub-sectors. Because of the economic importance of mineral development and the widespread artisanal employment in mining throughout the Kivus, a detailed analysis of mine traffic was undertaken in Phase 2 of this Study. This is included in Annex 3.

It has not been possible within this short home-based review Study to assess the potential for large-scale agricultural development. Such Studies require extensive field surveys of farming systems by agricultural economists. Fieldwork undertaken during the study period found that in Masisi local authorities believe that there is some potential to trade vegetables and dairy products with Walikale. Other observers point to the possibilities of local oil palm development in North Kivu.

During the stabilisation period, it has been assumed that mining within the area will continue to focus on Artisanal Mining and that no large new deposits of Tin, Tungsten and Coltan will be found soon, at least not within the coming five years. The future road traffic volumes of Tin exports are likely to be very small. The research also noted that, for the low bulk *very high value* minerals such as diamonds and gold, the present system of transport via improvised landing strips, small runways and use of small cargo aircraft is likely to continue. The high security needed for this transport outweighs the higher costs of transport occasioned by air transport.

Although it is impossible to forecast Mineral Trading Counters (CDN) related traffic within the Road Influence Area with any degree of accuracy, perhaps a fair assumption would be that road traffic in the order of 1-5 vehicles a day would be generated along the two main provincial road routes in North Kivu as a result of the local governance measures associated with constructing and servicing the new CDN's.

It is expected that logging will be discouraged within the ZoI and in particular in the vicinity of the PNKB. Forecasts for traffic associated with industrial logging activities would not be necessary given that safeguards would need to be put in place around the PNKB and other Park areas to avoid large scale logging. Some local timber and charcoal traffic would be expected.

Traffic would be expected to build slowly as a result of gradual improvements in regional security following stabilisation. If security becomes difficult to provide for any reason, the stabilisation period might need to be extended. The MONUSCO road development strategy envisages a second phase of route improvement- perhaps in 5 years time which could include more substantial pavement works (perhaps even sealing in some areas) in line with an expected increase in traffic levels. The EU is considering undertaking a technical study for the asphalting (sealing) of Route Nationale 3, which includes the Goma-Masisi-Walikale route.

After implementation of the type of low-cost intervention treatments envisaged under section 2.3.1 above, it is not expected that traffic levels would rise much above 50 VPD in the post project situation for some time, due to the depressed state of the regional economy, high levels of unemployment, dis-incentives to private investment brought about by poor security in rural areas, etc.

The intervention design aims to build or upgrade the roads along their full length to a standard passable by 4x2 traffic travelling at an average of 40 kph. In later phases of investment, higher axle loads could be expected.

2.4.6 Consequence of Low Forecast Traffic Volumes

In the case of conflict situations, there is either no traffic present due to poor regional security or roads and bridges have been cut progressively over the years and not been repaired, which also leads to an absence of traffic. Hence in conflict situations, the conventional means for economic justification of a regional roads program (related to traffic benefits) is missing. For provincial roads the benefits accruing from Vehicle Operating Cost savings (VOC savings) typically form the highest proportion of scheme benefits but typically (also) require fairly significant levels of traffic (more than 150 VPD) to justify intervention on economic grounds alone.

The planned interventions in RITE2 aim to support stabilisation and help bolster security through a phased re-opening of provincial routes on an all-weather basis. However, due to the relatively low levels of road traffic (induced traffic) forecasted within the program influence area within the next five years, *it is unrealistic to assume that the RITE2 program would be economically feasible on the basis of generated traffic benefits*. In summary, present and future road traffic volumes are low (in step with the proposed engineering design) and future benefits accruing from conventional VOC savings and VOT savings would be minimal.

2.5 Economic Benefits

2.5.1 Introduction

Following a review of the literature, an examination of previous Studies and the findings of DFID field missions, an assessment of economic benefits has been made. Where possible, benefits have been valued and quantified.

Regional GRDP data were obtained by DFID in mid-December 2011. It was found that North and South Kivu each contribute about 5 percent to total GDP, in USD terms. Unfortunately, no breakdown of GRDP is available by sector. However, in the case of North and South Kivu Provinces, it is expected that the mining sector forms a relatively high proportion of GRDP. Further research of Regional GRDP is strongly suggested. Considerable assistance has been provided (in various aspects of the benefit assessment) by DFID technical staff who undertook fieldwork in Eastern DRC in Q4, 2011 and who provided both data and valuable technical comments. It was noted by DFID that the benefit assessment is regarded as conservative, as there are a significant number of non-quantifiable benefits.

A brief review of current research (further expanded in Annex 5) has indicated that further research into the economic impacts (benefits) of post-conflict transport investment programs is needed. (It does not seem to be a high priority research area; even though many post-conflict assistance programs involve substantial road sector investments). There is an absence of practical examples of post project road program benefit assessment in conflict regions. Whilst detailed research is not yet available, knowledge is expected to increase over time, and DFID note that the Program M&E framework can assist this research.

The following section is sub-divided into two; first - an assessment of quantifiable economic benefits, and second - an assessment of non-quantifiable economic benefits18. The lack of detailed data in this area has been noted above. Benefits are difficult to value precisely and broad estimates have been made in the cases where quantification has been attempted.

It has been important to include non-quantifiable economic benefits in this appraisal, as the DFID field mission and later correspondence with MONUSCO, etc, have identified several important areas of benefit (although hard data do not –yet- exist).

18 A detailed discussion of the nature of regional stabilisation benefits took place with DFID during December 2011. Current uncertain ties in the regional security situation in the post election period have impacted the reporting.

2.5.2 Quantifiable Benefits- Mining Sector Support

Mining is one of the few remaining economic activities in eastern Congo, apart from subsistence farming and informal economic activities. Research indicates that in Congo and neighbouring countries, around 10 million people, including those directly involved in the trade as well as their dependents, are supported by mineral exports from eastern Congo. Furthermore, the Provinces of North and South Kivu have abundant resources of mineral wealth, both in high value low bulk minerals such as Diamonds and Gold, but also in low value low bulk minerals such as Tin, Coltan and Tungsten.

The rehabilitation of transport infrastructure should be one of the main priorities for investment since it will further the development of the mining sector by stimulating legal trade and serious investment. However, several challenges have to be taken into account, including insecurity, logistical problems and maintenance of the repaired infrastructure. Rehabilitation of the provincial routes is a necessary condition to permit the development of traceability systems to satisfy due diligence requirements (Dodd-Frank legislation). In the absence of these systems the mining industry in the Kivus will continue suffer greatly in terms of reduced output and low prices. Hence the implementation of the roads program, along with other important measures could help considerably, in time, to transform the prospects of the artisanal mining industry in Eastern DRC.

Centres de négoces are being constructed where the products of certified legitimate (conflict-free) mines within a 20 to 30 kilometre radius can be sold on for export and tax collected. Four centres de négoces have been built, whilst a fifth is to be constructed.

Improved access to the new centres de négoces will support the development of traceable supply chains that comply with due diligence requirements and which could help swing the balance more in favour of legitimate trade. This change in the nature of the trade will form the main benefit to the industry associated with an increase in the value per kg of tin and coltan as they becomes acceptable again on international markets.

The question of attributability to the road program investments to the reform of the mining industry in the Kivus would need to be addressed in more in depth, most probably through enhanced monitoring and evaluation frameworks. The traffic analysis undertaken in Annex 3 and the description of ASM mining could be an important starting point for further detailed economic studies and research in post conflict areas.

Annex 3 benefits from the experience of DFID's Mining Consultant (report) and from supplementary commentary provided by a Senior DFID Manager. It is noted that this important section of the EA has been prepared without the benefit of a field visit, hence the precision of some statistics may not be wholly accurate, although it is hoped that the 'orders of magnitude' are correct. Details of the annual benefits from road network improvement as assessed based on the consultation, research and reports are provided in Table 6 below.

Table 6 Estimation of Impact of Improved Regional Road Network on Mining Industry: Potential Annual Benefits

Province (Program Area)	Mineral	Present Volume Tonnes	Present Price per MT US$	Present Value Million US$	Future Volume Tonnes	Future Price per MT US$	Future Value Million US$	Difference US$ Million	Annual Benefit Assumed US$ Million
North Kivu and South Kivu	Tin	10000	11000	110	11000	22000	242	132	6.6

Source: Consultants Estimates and IPIS data November 2011

Whereas the (non precious) metals Tin, Coltan, Tungsten and Niobium are mined throughout the Kivus, the benefit assessment has focussed on the main mineral mined, Tin. Production volumes and locations for these other minerals are less well known and are much lower in production quantity. A crude estimate of current value of tin exports assumed an annual production volume of some 10,000 MT. The potential impacts of an improved regional road system on regional economic development are in its assistance to legitimise the regional ASM industry; therefore leading to higher future tin prices for local mine output (e.g. a move towards world market tin prices).

A minor increase in production has been assumed in the post project case. The industry response could be greater than this. A conservative estimate of the total *increased* value of future tin sales lies in the order of USD 132 million per year. Of this total benefit, perhaps 5 percent could be attributed to the provision of an improved regional road network and a functional CDN system (in the order of USD 6.6 million per annum). The estimated annual benefits derived in Table 6 were simply distributed (allocated) across the four program roads, according to route segment costs.[19]

2.4.7.6 Difficulties in Estimation of Benefits from ASM Mine Development and Legitimisation

The estimation of annual benefits from ASM Mine Development attributable to road network development is clearly imprecise. Full realisation of benefits may also be dependent upon other external and complimentary measures being provided. Furthermore, it has been assumed that conflicts will not resume during the stabilisation period. The latter cannot be guaranteed, unless the root causes of conflict are also addressed. Annual benefits have been estimated on the assumption that the improved regional road network will spur ASM development in South Kivu and North Kivu in particular will assist the functioning of the CDN's. Having said that, the regional mine output is substantial and valuable, it is currently undervalued due to Dodd-Frank, and clearly stabilisation and road network improvement could spur development and regional economic benefit.

However, the benefits will need to be closely monitored over time through comparison of the present regional baselines with new regional M&E data as it is collected. DFID plans to engage an M&E specialist in SSU to ensure that in future a stronger economic appraisal case can be made for similar programs. The M&E specialist should inter alia measure the impact of roads development on ASM development and stabilisation of the local economy. Some obvious indicators could be identified for monitoring purposes.

2.5.3 Non Quantifiable Benefits - Security and Stabilisation

As noted above by DFID, even though hard data do not support an economic valuation of the benefits indicated in this section, their importance needs to be highlighted within this EA.

The IDC states under Clause 88 that '*fragile and conflict –affected states posed particular challenges for the provision of infrastructure'.* It noted that conflict often involves the destruction of infrastructure and that rebuilding it is often further complicated by governance failures inherent in post conflict environments. Post-conflict re-construction, including re-establishing basic infrastructure, therefore forms part of stabilisation and economic development strategies.

The roads proposed to be upgraded were once important trading routes connecting the fertile lowlands around Shabunda and Walikale to Bukavu and Goma, respectively the capitals of South and North Kivu. The roads have been impassable for a many years and the areas along these roads are rebel strongholds. Reopening these roads will provide access for MONUSCO and FARDC to start to stabilise the area. The stabilisation program is aimed at improving security over a wide area, at building and strengthening Governance systems and at reducing the high costs of doing business (high transaction costs) within the Kivus. Some illustrations of current high transaction and establishment costs are provided below. The first example relates to potential UN/MONUSCO cost savings, the second example concerns high PNC establishment costs, the third example relates to high CDN establishment costs and the fourth example concerns potential UNCHR (and NGO) operational arrangements. In each case, significant benefits are expected to result from the provision of a provincial road network which would permit year-round access on the ground, although the means to quantify these benefits does not yet exist.

EXAMPLE 1 Troop rotation savings

The current MONUSCO deployment and activities in Masisi/Walikale could serve as a baseline. In terms of direct impact to security, the rehabilitation of the road network will allow the current 1,400 peacekeepers deployed along the road (in 8 COB and 8 TOB) to patrol and secure larger areas around their bases and to react quicker to security incidents and threats to civilians. They are

19 To attempt to distribute the savings any more precisely would not have been sensible, given the uncertainty over the estimates.

currently having three to four patrols daily in a maximum of 15 km perimeter around their bases. Currently 8 helicopter rotations are needed every week to re supply the troops. *If roads were available troop rotation would be much less costly.* The program will remove impassability on main through provincial routes which should gradually improve safety and security. Through moving garrisons and supply operations closer to regional settlements- perhaps at Walikale- not only could there be considerable cost savings but also peacekeeping operations from these regional areas could be much more effective.

EXAMPLE 2: Establishment and Manning of Provincial Police Stations (S/CIAT's)

At present, in the absence of a functional regional road network, MONUSCO has difficulty projecting authority in remote areas. Policing activities are not located 'on the ground' hence staff cannot be deployed from local police stations. The SSU have drawn attention to the problems of servicing and equipping an existing PNC station on the Masisi - Walikale route. Since there is no road access, this transport task is currently undertaken, at huge expense, by means of helicopter transport. If hard data existed the Evaluation Team could utilise costs of supply by helicopter to estimate the potential reduced cost of delivering a police presence in areas that are currently inaccessible by road.

There is no real existing PNC outpost on the Hombo - Walikale axe (see Figure 1 of a S/CIAT). MONUSCO have tried to deploy 60 policemen in Luvungi (close to Mpofi) following a mass rape in 2010. To support the deployment cost us around 20 000 $ par month. Within the framework of I4S MONUSCO plans to construct police stations at the following locations:

1. S/CIAT: Hombo Nord
2. S/CIAT: Njingala
3. S/CIAT: Nyabiondo
4. CIAT: Birue
5. CIAT: Itebero
6. Etat Major et CIAT: Walikale Centre

However, without the road rehabilitation it will not be possible to sustain any deployment on this Axis.

Figure 1 A S/CIAT

Source: MONUSCO November 2011

EXAMPLE 3: Establishment of Mineral Trading Counters (CDN's)

A third example is provided by the program to establish Mineral Trading Counters (CDN's) within the Area of Influence. Following road improvement five *centres de négoces* at Itebero, Isanga, Rubaya, Mugogo and Numbi will be able to function. MONUSCO's Stabilisation Support Unit believes that the upgrading of the roads would permit the five centres to become operational, specifically through facilitating:

- Deployment of trained *centre de négoces* personnel;
- Deployment of police to protect the sites and allow supplies to reach them;
- Opening up of mineral-rich areas, allowing better control of mineral exploitation (such as working conditions, child labour and environmental protection); and
- Creation of poles around which economic development can be re-launched, for example through agriculture and the creation of markets.

The successful operation of the *centres de négoces* could be substantially assisted through provision of improved provincial road access. The successful operations of the CDN's will require improvements in security. Successful operations of the CDN's would be a precursor to broader regional economic development. It is expected that once the centres de négoces become operational, the RITE2 roads will permit greater traceability over legitimate minerals.

At present, it has been necessary to airlift basic building supplies to complete the construction of thee CDN sites. This activity can be done at greatly reduced cost through transport of building materials to the sites by road. It is difficult to consider a fast pace for regional development if all construction activity within the influence area continues to be undertaken using the air transport.

The improved roads are seen therefore as a necessary (but not sufficient) condition to permit the development of traceability systems to satisfy due diligence requirements (e.g. the Dodd-Frank legislation). In the absence of these systems, the mining industry will continue to suffer greatly.

EXAMPLE 4: Establishment of UNCHR Cluster Teams at the Local level

Within the framework of the cluster approach to IDP issues, UNCHR leads the protection and camp coordination and management clusters. As conflict continues to prevail in North Kivu, people of concern to UNCHR are subject to continued abuse by armed groups, and there is an increase in sexual violence. At present, some areas where intervention is deemed necessary remain inaccessible, and some return areas have only a small presence of UN agencies and development actors. State authority is tenuous in the remote areas where the majority of returnees live. For effective UNCHR support to cluster operations20, improved regional connectivity should facilitate local UNCHR deployment and operations. UNCHR will continue to work closely with WFP, ICRC, FAO, UNDP, UNICEF WHO and some 28 implementing partners, eight of which are national NGOs.

These examples illustrate the logistical difficulties of spurring development in the remote areas of the Kivus. They provide evidence of the need for road infrastructure and re-opened routes to support the stabilization and economic development process. Better infrastructure can help to create a secure environment and helps support police and civilian activities. There are clearly potentially many other similar examples where UN and GoDRC led development is currently constrained by high costs of establishment and access within the Influence area.

2.6 Socio-Economic Benefits

As described in section 2.1 there are important (non-quantitative) socio-economic benefits to be gained through a continuation of DfID's road sector investments in Eastern DRC. The number of potential non-quantified benefits arising from the RITE2 program cannot adequately be captured in a narrow economic analysis. They might considerably enhance the importance of the RITE2 program when considered from a wider perspective.

Following a review of the literature and examination of the study reports the main socio-economic benefits are described below.

20 Democratic Republic of Congo IASC CLUSTER APPROACH EVALUATION, 2ND PHASE Country Study, April 2010, Andrea Binder, Véronique de Geoffroy, and Bonaventure Sokpoh

2.6.1 Principal Socio-economic Benefits

It is widely documented and agreed as being "difficult" to quantitatively measure the social and economic effects and impact of improved and maintained provincial and rural road programs, especially because of the lack of appropriate baseline socio-economic data, and the difficulty of isolating the effects of the roads alone. However, the benefits of improved roads in primarily agricultural areas deduced from studies/literature include the following:

- Improved access to markets, for both selling and buying of agricultural and other commodities and introduction of new shops/market areas;
- Improved provision of and physical access to social/welfare/administrative services, i.e. schools, health centres, government administration;
- Improved integration of different ethnic groups[21];
- Increased employment opportunities through induced agricultural and other businesses; and
- Improved GoDRC public administration and security sectors.

The RITE2 Program can lead to stimulation and intensification of economic activities within and outside the transport sector, as additional investment can be created with much lower input of capital. Potential non-quantified benefits include:

- Upgraded access through a large and relatively remote rural area, providing an improved means to support delivery of a range of basic rural services, development programmes and security for the local population; and
- Increased competition and lower prices for services and better prices of practically all commodities.

More reliable and less costly transport services possible through the Project, will enhance accessibility of markets, health and education facilities and to employment opportunities.[22]

Certain areas where benefits are expected but which may not be easily monetized, could be expanded in a supporting qualitative assessment following research. It is noted that there is limited focus in the literature on the degree to which the opening of roads facilitates the provision of services by NGOs and local government.

2.6.2 Base Line Surveys and Development of M&E Systems

In order to maximise socio-economic benefits, the program specific indicator framework should be enhanced and further Baseline surveys should be undertaken, in order to extend the project monitoring and evaluation system. With such an approach, socio-economic benefits could be maximised. (There might be significant socio-economic benefits arising from fuller employment, particularly of women).

2.6.3 Network Effects

This section examines the connections between the proposed roads and other road networks in the DRC. The Kivus (and in particularly North Kivu) can be classified as a peripheral area in terms of its distance from the centre, the isolated and unconnected networks and the poor accessibility /high transport costs. Peripheral areas usually indicate a low level of infrastructure network and cannot easily receive spillovers from contiguous non-peripheral regions.

The proposed Interventions on Links 1, 2 and 4 are linked, since a (key) network of provincial roads in North and South Kivu are being opened and rehabilitated. It is expected that spillover benefits from

21 From the 1990s onwards, the Kivus experienced various inter-ethnic conflicts (mostly with a regional character involving Rwanda, Burundi, Uganda and Angola) and large refugee influxes.

22 Further qualitative assessments of Improvements in Health care and Education facilities within the ZoI as a result of improved road access will need to be elaborated by DfID's Socio-economic assessment consultant.

investment in all three roads will be greater than if any one of the three roads was to be improved in isolation. (The intervention on the Shabunda - Isezya- Bukavu route is not linked explicitly to the other three interventions because it is a long distance away and has already been improved to a base level of passability). Improvements in security brought about by reliable all weather road access could assist to improve stability across a wider area, hence proposed interventions in North Kivu could assist to improve stability in South Kivu. The legitimisation of ASM is expected to lead to improvements in economic performance throughout the region.

Investments in roads can have positive spillovers on other basic facilities. In India it was found that with better quality roads, water supply and sanitation has improved. Communities can have better access to postal services and bank facilities. Sometimes local house construction can improve when improved roads permit better accessibility and transport of raw housing materials.[23]

3 EVALUATION RESULTS

3.1 Program Results

The results of the assessment of the incidence of costs and benefits associated with the proposed roads are shown in Table 7 below.

Table 7 Road Improvements in Eastern DRC RITE2: Program Summary

RITE Phase II
Economic Internal Rate of Return
Program: Roads Improvement in Eastern DRC
SUMMARY SHEET

No	Route	EIRR	NPV Project US$ Million	Length Km
1	Nyamirera- Walikale	19%	1.31	128
2	Kaseke- Bunyakiri	20%	1.08	72
3	Burhale-Isezya- Shabunda	17%	1.68	239
4	Sake- Nyabiondo- Walikale	19%	1.85	189
	TOTAL all Four Routes:	**19%**	**6.35**	**628**

Source: Consultants Estimates

The Base Case results for all routes have positive Economic Internal Rate of Returns (EIRR's) (above the hurdle rate) and Program Net present Values (NPV's) are positive totalling some USD 6+ million in total for the full program of four routes.

The analyses is summarised as the total of all routes in ToR plus the PNKB bypass route (628 kms).

The EIRR and NPV change depending on (i) the selection of road investment (individually or in combination).

3.2 Results by Route

The economic results by route are provided in Annex 4. The Cost-Benefit Analysis (CBA) format of the DfID Economic Appraisal Model was adopted.

The combined result for all routes is provided in Table 8 below. Costs are indicated as Economic Costs.

23 Social Impact of Globalizing Transport Services: The Case of India International Transport Forum 2009 Arpita Mukherjee Indian Council on International Economic Relations

Table 8 Combined results for all four Routes

RITE Phase II
Economic Internal Rate of Return
Sub-project: All Prorgam Roads

($)

Year	Incremental Cost		Incremental Benefits	Net Costs and Benefits	Sensitivity Analysis				
	Capital	O&M			Case 1	Case 2	Case 3	Case 4	Case 5
				0.00					
2012	3.45			-3.45	-3.79	-3.45	-3.45	-3.45	-3.45
2013	5.53			-5.53	-6.09	-5.53	-5.53	-5.53	-5.53
2014	11.86			-11.86	-13.05	-11.86	-11.86	-11.86	-11.86
2015	0.00	0.42	3.83	3.41	3.41	3.37	3.03	2.99	-0.42
2016	0.00	0.42	5.91	5.49	5.49	5.45	4.90	4.86	3.41
2017	0.00	0.42	5.94	5.52	5.52	5.48	4.93	4.89	5.49
2018	0.00	0.42	5.97	5.55	5.55	5.51	4.95	4.91	5.52
2019	0.00	0.42	6.00	5.58	5.58	5.54	4.98	4.94	5.55
2020	0.00	0.42	6.03	5.61	5.61	5.57	5.01	4.97	5.58
2021	0.00	0.42	6.06	5.64	5.64	5.60	5.03	4.99	5.61
2022	0.00	0.42	6.09	5.67	5.67	5.63	5.06	5.02	5.64
2023	0.00	0.42	6.12	6.54	5.70	5.66	5.09	5.88	5.67
2024	3.41	0.42	6.15	9.98	9.10	9.10	8.53	9.32	9.11
EIRR				**19%**	**17%**	**18%**	**16%**	**16%**	**14%**
Net Present Value discounted @ 12% ($)				**6.35**	**4.34**	**5.77**	**3.66**	**3.90**	**2.24**
Base EIRR				**19%**					
Sensitivity Analysis - Key Variables									
Case 1 - 10 percent Increase in Capital Costs				**17%**					
Case 2 - 10 percent Increase in O&M Costs				**18%**					
Case 3 - 10 percent Decrease in Benefits				**16%**					
Case 4 - 10 percent Increase in O&M Costs and 10 percent Decrease in Benefits				**16%**					
Case 5 - Project Benefits delayed by One Year				**14%**					

Source: consultant's estimates

3.3 Sensitivity Analyses

3.3.1 Sensitivity Tests

An identification and assessment of key risks and assumptions with important implications for the economic and VFM appraisal was modelled in the form of five Sensitivity Test Cases (ST's) as follows:

Case 1 - 10 percent Increase in Capital Costs

Case 2 - 10 percent Increase in O&M Costs

Case 3 - 10 percent Decrease in Benefits

Case 4 - 10 percent Increase in O&M Costs and 10 percent Decrease in Benefits

Case 5 - Project Benefits delayed by One Year

3.3.2 Sensitivity Test Results

The ST results by route are provided in Annex 4 (Table 5). In all cases EIRR remained positive with a positive NPV. Although the economic appraisal has shown that the program is feasible in Case 1, NPV is reduced and hence very careful monitoring and control of costs is recommended in RITE2.

3.3.3 Risks Bearing on the Economic Appraisal

This section assesses risks that have a bearing on the economic appraisal only.24 The two most likely economic risks are those of an increase in construction cost and a decrease in benefits.

24 Broader risks are considered by the DFID team in other areas of the Business Case.

According to the sensitivity testing the EIRR will drop to a still acceptable 15% (with a positive program NPV) given either a 10% increase in construction costs, or a 10% decrease in benefits.

The former risk can be controlled, or perhaps minimized, through careful monitoring of input costs throughout the duration of the construction period. The latter risk relates to the results of elections, the progress of development plans, in particular the legitimization of ASM and the presence / absence of conflict in coming years. In terms of achieving the intended outcomes these risks are judged as medium-high.

It is likely that the realization of the socio-economic benefits will similarly depend upon the success of the stabilization and mine legitimization plans. Thus the risk that this project is unable to meet its economic objectives is assessed as medium/high.

To measure changes in indicators: a clear plan needs to be in place to capture baseline data on the selected indicators. A robust way for assessing changes in these indicators then needs to be developed, and implemented in line with good practice. It is noted that the preceding RITE program has enabled a progressive engagement approach and institutional and partnership arrangements are already in place.

4 SUSTAINABILITY ISSUES

The following section includes a brief appraisal of two issues linked to the sustainability of the program interventions.

4.1 Road Maintenance Systems

DFID has taken the lead in ensuring that effective maintenance systems are put in place for the roads in Eastern DRC. We have used three of our programmes, including the first phase of Roads in the East (RITE1), to allocate funds to maintenance to ensure the short-term sustainability of returns on our investments, while working with the government to put in place a National Roads Fund to finance the long-term maintenance of the roads system and therefore safeguard its sustainability. A second phase of the Roads in the East programme would allow DFID to secure, for the first time, commitment from the Government of DRC to finance and manage the maintenance of priority provincial roads in the form of a Memorandum of Understanding (MOU).

4.2 Vehicle Overloading and Rain Barriers

There is a need to clearly articulate and promulgate the damaging effect of overloaded vehicles as a Program Design Safeguard. A policy for Rain Barrier Operations should be established and enforcement mechanisms developed as a Program Design Safeguard.

5 FISCAL IMPACT ISSUES

The following section includes a final appraisal of issues linked to the fiscal impact of the proposed roads program and provides an overview of public expenditures on infrastructure at the central level.

5.1 Public Expenditure on Infrastructure

The DRC faces what is probably the most daunting infrastructure challenge on the African continent. As a result of conflict, networks have been seriously damaged or left to deteriorate. Today, about half of the existing infrastructure assets are in need of rehabilitation. Even before the conflict, the lack of basic infrastructure made it difficult to knit together the country's disparate economic and population centres. The country's vast geography, low population density, extensive forests, and criss-crossing rivers further complicate the development of infrastructure networks.[25]

The DRC needs to implement an ambitious infrastructure investment agenda. In order to meet its most pressing infrastructure needs and to catch up with developing countries in other parts of the

25 The Democratic Republic of Congo's Infrastructure A Continental Perspective Vivien Foster, Daniel Alberto Benitez The World Bank Africa Region Sustainable Development Department March 2011

world, the DRC needs to expand its infrastructure assets in a number of key areas. Meeting illustrative infrastructure targets for the DRC would cost close to USD 5.2 billion per year for the next decade, *including over USD 1 billion for maintenance*. Capital expenditure would account for 80 percent of this overall requirement. The power, transport, and water supply and sanitation (WSS) sectors would each demand sustained spending of USD 1.5 billion per year.

Table 9 Indicative infrastructure spending needs in the DRC, 2006–15

	$ million per year		
Sector	CAPEX	O&M	Total needs
ICT	246	242	487
Power (trade)	1,424	49	1,473
Transport (basic)	1,082	391	1,474
WSS	1,278	431	1,709
Total	4,045	1,112	5,157

Source: Mayer and others 2008; Rosnes and Vennemo 2009; Carruthers and others 2009; You and others 2009 [26]

The total spending requirement is high in absolute terms and even more so relative to GDP (Table 9). At close to USD 5.2 billion, in absolute terms, the spending need for infrastructure is among the highest in Africa. Relative to the size of the DRC's economy, the spending amounts to a staggering 75 percent of 2006 GDP. This is by far the highest burden of infrastructure spending for any African country, and is substantially higher than the average of low-income, fragile states. Investment alone would absorb around 57 percent of GDP. It is clear that in 2006 DRC's spending on infrastructure covered little more than 10 percent of its needs. In the period leading up to 2006, the DRC's infrastructure spending from all sources appears to have been very low—likely no more than USD 700 million per year, or a small fraction of the amount needed to reach illustrative infrastructure targets. On the other hand, official external finance for infrastructure—whether from OECD or non-OECD sources—amounted to no more than USD 62 million per year over this period. Overall public investment for all (infrastructure and non-infrastructure) sectors was no more than USD 100 million in 2006 and increased only modestly in 2007 and 2008.

5.2 Expected Fiscal Impacts of RITE2 Program

The capital expenditure for the DFID RITE2 program will not require GoDRC counterpart funding, and will have no impact on revenue, so will therefore not have a direct fiscal impact in the short term or any negative fiscal impacts on the Economy. The operational expenditure for the program will require maintenance finance from FONER for all four roads.

In the longer term, it would be ideal if provision could be made in the GoDRC budget to ensure that sufficient funds are allocated for provincial road rehabilitation and reconstruction. In the short to medium term it is unrealistic to think that this will happen, at least to a sufficient extent and donor funding for roads programmes are likely to be necessary. The spending on the roads program is therefore consistent with sectoral policy and current budget priorities and therefore poses no financial or economic risk.

6 RECOMMENDATIONS

6.1 Principal Findings

On the basis of the information available to the Review at end November 2011, a recommendation for investment in the whole network of key provincial roads under analysis is proposed.

26 Figures refer to investments (except those in the public sector) that also include recurrent spending. Public sector covers general government and nonfinancial enterprises. O&M = operations and maintenance; CAPEX = capital expenditure

The importance of combining Routes 1 and 2 within a single program has been discussed previously. The need to include section 2: the Kaseke- Bunyakiri route is based on the need to ameliorate potentially adverse environmental impacts on the PNKB, through provision a bypass route, following re-opening and improvement of the main axis- Bukavu- Walikale (and thereafter:- Lubutu- Kisangani).

Continuation of RITE Phase 1 assistance on the Shabunda- Isezya axis will help lock in the present improvement in economic conditions, will extend security arrangements further towards Shabunda and will preserve the value of previous investments.

Finally, the Walikale – Nyabiondo – Sake route is recommended for inclusion in the RITE2 roads program. It will be these two main axes of improvement (Nyamirera – Walikale AND Walikale Nyabiondo-Sake) which should spur economic development in the Kivus, in tandem. In the short to medium terms the two through-routes Bukavu- Kisangani and Goma-Kisangani could be re-opened, thereby spurring development throughout a wider region. It is not recommended to omit either one of these two routes from RITE2, as stabilisation and the pace of economic development are likely to be slower.

The Congolese government should develop a development plan for opening up the hinterland. This plan should be based on three cornerstones: infrastructure, transparent administration and security. Furthermore it is recommended that some further research into economic aspects of post conflict transport investment programs is undertaken (Annex 5).

6.2 Mitigating Program Risks

There remain some program risks notably in the organisation and operation of routine and periodic maintenance activities on the RITE program roads, in due course. Usually sustained maintenance has been a problem in Sub-Saharan Africa. However, since the program roads will be upgraded to a maintainable level, it is expected that FONER's philosophy to give priority to such roads when allocating annual maintenance budgets, may assist in mitigating this risk.

Careful monitoring and control of program costs is recommended in RITE2. This could take the form of regular periodic reviews of achievement of cost targets and introduction of remedial measures before (any) cost overruns occur.

There is a need to monitor vehicle loading (weights) along each main route and to assess whether any rain barriers would need to operate on certain route sections following periods of heavy rainfall. If rain barriers are introduced traffic using the improved routes should respect the guidance of the persons responsible for operating rain barriers.

6.3 Attribution to DFID

The results of the specific RITE2 intervention can be directly attributed to DFID. The UK Parliament International Development Committee (IDC)[27] noted in respect of the bilateral aid extended for the 'road- building project' in DRC, that the circumstances demanded this as being the best approach and that DFID should tailor its country programs to the greatest needs in each context.

6.4 Extending the Socio-Economic Baseline Surveys

Some proposals for enhancement of the Socio-Economic Baseline Surveys are included in the bottom part of Table 10. Conventional Socio-economic indicators *may* not be sufficient in post conflict environments. Infrastructure investment has a multiplier effect as its presence is a means to fulfil wider objectives such a growth, employment, empowerment, poverty reduction and improved health.[28] Clearly monitoring improvements in the Health, Education and other sectors are important. However an evaluation focussed purely on examination of sectoral impacts may not be able to monitor Stabilisation adequately.

27 DFID's role in Building Infrastructure in Developing Countries- UK Parliament International Development Committee.
28 Adam Smith International-written evidence submitted to IDC.

Table 10 RITE2 Socio Economic Benefit Monitoring

No.	Socio Economic Benefit Category	Proposal for Consideration	Indicator
	1. Conventional Socio-Economic Benefits of this type of intervention		
a	Improved access to markets, for both selling and buying of agricultural and other commodities and introduction of new shops/market areas	Monitor any shops and markets within the ZoI, monitor market days and assess market attendees or turnover	Nos. of new shops, nos. of new market places within the ZoI, Market attendance, Market turnover (a proxy may be tax receipts)
b	Improved provision of and access to social/welfare/administrative services, i.e. schools, health centres, government administration	Monitor any new clinics, schools, or government offices within the ZoI. Monitor enrollments at existing schools, or staffing at existing clinics, etc.	No. of new schools and clinics, etc. Nos. of school pupils within ZoI, Nos. of Clinic patients within ZoI, etc. No. of functional Clinics, No. of closed Clinics.
c	Improved social integration	This benefit can probably be monitored through 2b below	na
d	Increased employment opportunities through induced agricultural and other businesses	reductions in unemployment either of local inhabitants or of returnees. This may need a study to help assess how to do it. It could be attached to one of the planned S-E Studies?	Not yet defined
	Reduced accident rates through safer 'engineered' routes	No data is available on the economic cost of serious /fatal accidents along the project roads. Start to collect any accident data in the baseline surveys.	No. of fatalities, no. of Serious Injury accidents , no. of Damage Only accidents
	2. Some Specific Socio-Economic Benefits of this intervention within Eastern DRC		
a	Improved security situation, especially for Vulnerable Groups	Monitor no. of incidents and monitor the *severity* of those incidents. Enumerate women and children incidents in particular, since these will be a focal area to detemine an improved security situation within the ZoI	data on Incidents probably already monitored by I4S MONUSCO, Nos. of returning IDP's
b	Re-establishment of the rule of law, re-establishment of Local Governance	Return of Government employees to regional centres in Walikale, Shabunda, etc. Select some key GoDRC agencies which are being de-centralized. This may need a Special Study. It could be trialed as part of on of the planned S-E Studies? Monitor any changes in local regulations which permit registration or processing at regional centres (decentralized from Bukavu and Goma, for example.	No. of returning employees, no. of new regional posts created, etc. Changes in Regional Governance Arrangements
c	Improved local operations of NGOs	Monitor extent of NGO operations through I4S or MONUSCO perhaps	No. of NGOs operational within ZoI
d	Re-settlement of IDP's	Monitor re-settlement of IDP's within ZoI	Statistics on Resettlement within ZoI

Source: Consultants Research

The Socio-economic framework and the M&E system could be extended to assess some other questions about impacts of the infrastructure investments such as:

- What are the potential impacts of improvements in zonal security on people's lives brought about by phased road development?
- Is the number of security incidents reduced; is the severity of security incidents reduced?
- Can the number of decentralised activities, positions and processes be monitored?
- Is there any change in local (decentralised) operations of NGO's?
- Does the improved regional accessibility lead to the resettlement of IDP's?
- How does stabilisation provide pre-conditions for improvement in the pace of local economic development?
- To what extent would (any) other complementary program components be helpful?
- What are the implications for speeding up or slowing down investment scheduling (timing)?

New monitoring indicators would be expected to *complement* the important sectoral technical indicators which have already developed (such as kms of roads constructed or rehabilitated fares, local commodity prices, etc.) within the present Logframe.

A1 DEVELOPMENT OF KEY VFM METRICS

A1.1 Introduction

This section outlines measures to be used or developed to assess VFM.[29] The section below briefly describes the development of key VFM metrics at the level used by DFID in assessing VFM, i.e. economy (including unit cost of inputs).

A1.2 Economy

A1.2.1 Input Metrics

The program could compare the unit cost of inputs for road construction (based on a per km cost). The cost of inputs per km cost road construction and maintenance can be monitored on a yearly basis throughout the lifecycle of the project. Careful control and monitoring of program costs is recommended in RITE2. This could take the form of regular periodic reviews of achievement of cost targets and introduction of remedial measures before (any) cost overruns occur. Institution of a mechanism for regular reporting of unit costs would be a key element to reduce risks and would be an important part of VFM monitoring

A1.2.2 Effectiveness Metrics

This section includes measures and ratios from the economic appraisal such as the NPV and the EIRR. In general, road investments in Eastern DRC offer good VFM. Economic rates of return have been conservatively estimated at between 12 percent and 38 percent[30] for the World Bank Roads Programs, which have concentrated on the main National routes. For the provincial routes included in this current DfID review, the economic rates of return vary between a respectable 17 -20 %. The Effectiveness Metrics proposed for the Economic Case are therefore (a) EIRR and (b) NPV (expressed in USD millions). These Metrics are traditionally monitored in the post –project review period, when post-project assessments are made. The post-project evaluations of such road projects conventionally look at actual construction and maintenance costs and actual benefits and compare the EA results with the post-project situation. It is recommended that a period of time occurs before the post –project review is undertaken since in some case benefits are slow to realise and the review should be time to capture as full a picture as possible.

One substantial advantage of the use of standard CBA Metrics such as EIRR and NPV is that there is no need for reference to overseas comparators (from recent DFID projects elsewhere, for instance). The sole requirement is that the EIRR exceeds the threshold level or hurdle rate and that NPV is positive. The transferability of the CBA Metrics helps to reduce risk for the VFM appraisal. Confidence levels: data quality plays a significant part in any VFM judgement hence it is suggested that a post-project evaluation be carried out to confirm that the net present value remains positive.

A1.3 Next Steps

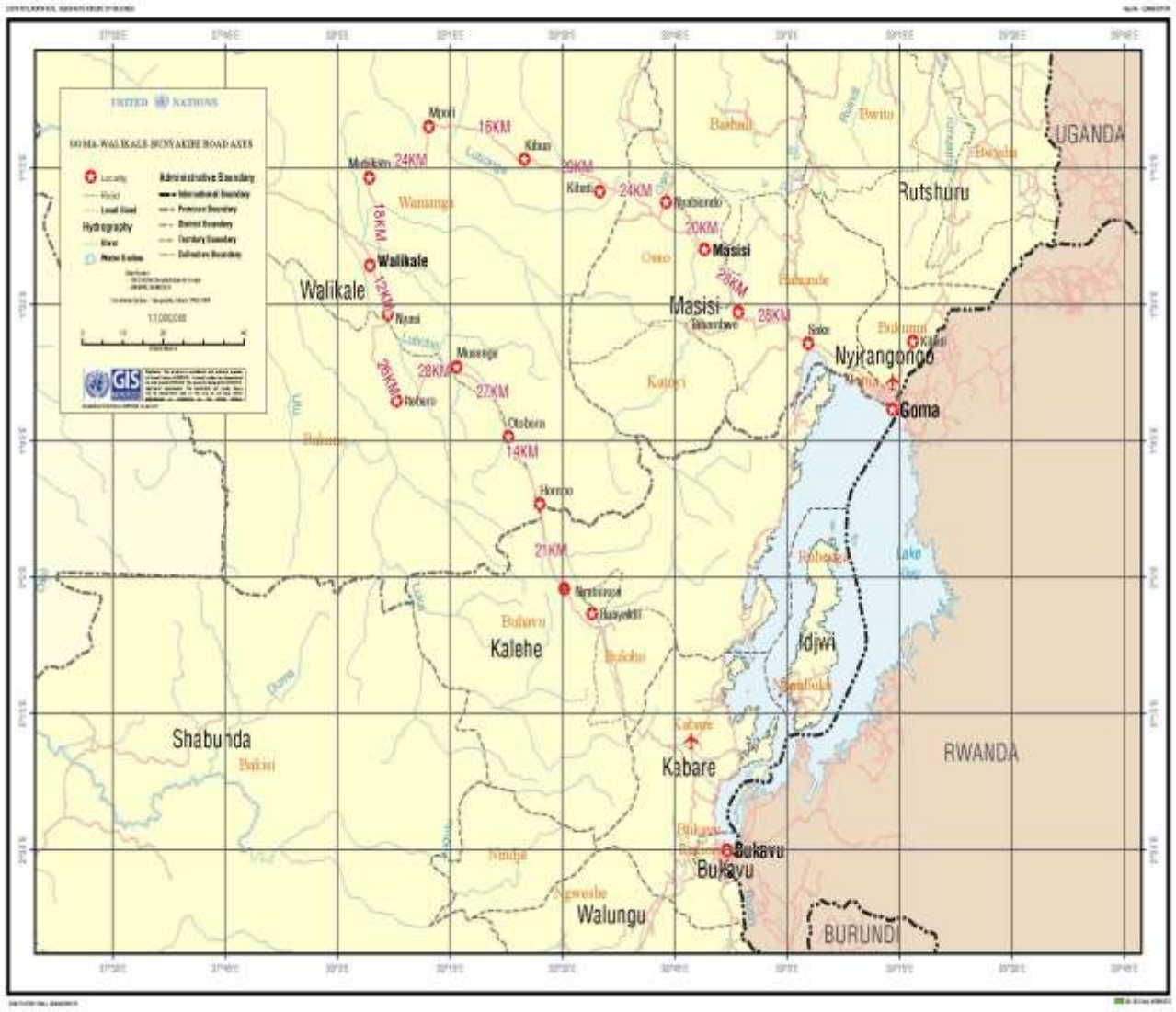
The Final Program Design concept for Phase 2 (Economic Analysis) has now been prepared. The next step would be to assimilate all of the Business Case elements within a single VFM appraisal matrix.

29 It is noted that the DfID How To Notes do not provide guidance on VFM Metrics for the Economic Case; hence indicators should presumably be developed on a case by case basis.

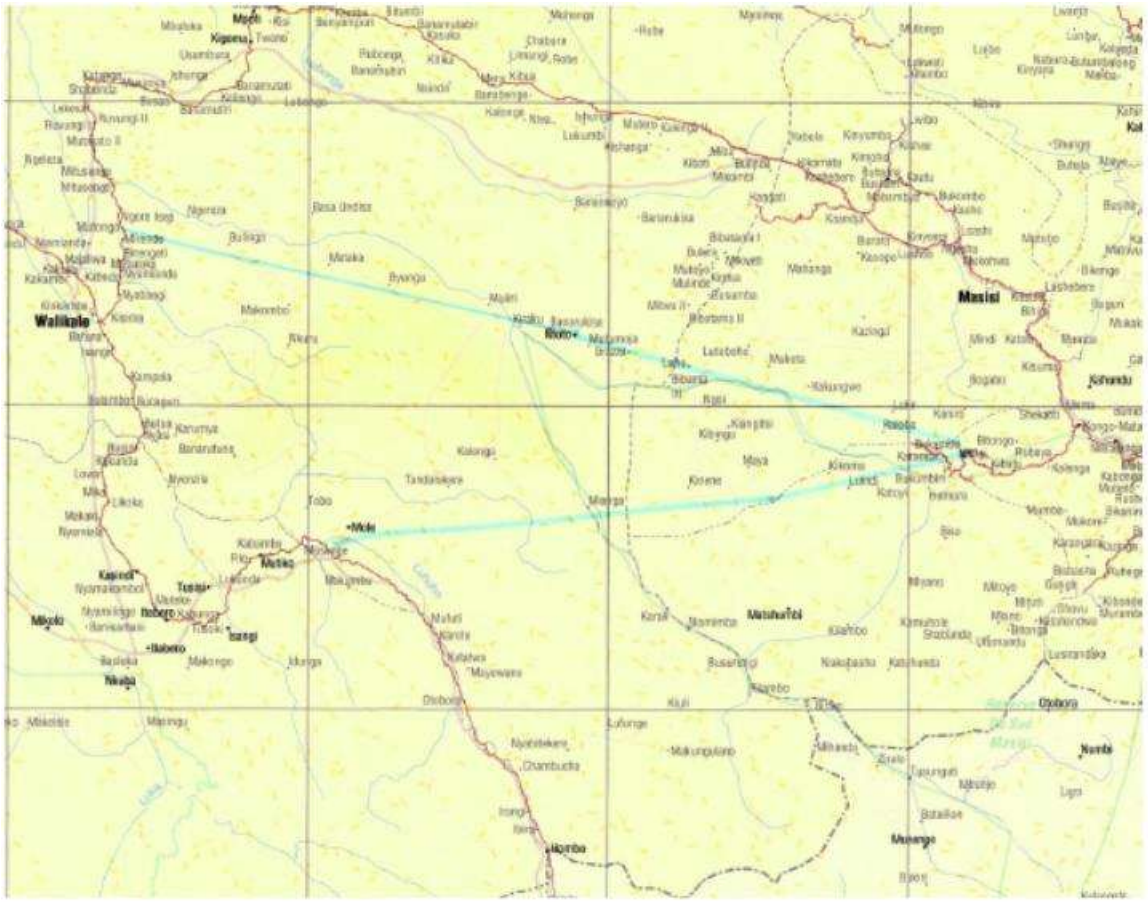
30 *ProRoutes Project Appraisal Document*, World Bank, 2008. This is a range of ERR calculated for various roads segments under current project plans and it is expected that other roads in DRC would yield similar returns. Returns are calculated on projections of reduction in transportation costs for key roads users and do not include wider indirect benefits.

A2 MAPS OF RITE2 PROGRAM ROADS

Map 1: RITE2: Nyamirera-Walikale and Nyabiondo-Walikale and Kasheke- Kando and Shabunda- Bukavu roads



Map 2: Two alternative routes – Bihambwe – Kiningi - Musenge and Bihambwe – Kiningi - Walikale (not recommended)



A3 ESTIMATE OF THE IMPACT OF MINING TRAFFIC ON THE RITE2 ROADS PROGRAM

A3.1 Introduction

Annex 3 describes the following:

1 Locations of mines, past present and future;

2 Crude estimates of Mine Production;

3 How Minerals are Transported in the Kivus;

4 Estimates of Mine Traffic on Program Roads (Primary- Mine Export); and

5 Estimates of Mine Traffic on Program Roads (Secondary- CDN's and Mine Supplies).

This topic was researched 9in some detail) for the Phase 2 Final Report, since mining development was mentioned in many reference materials, could *potentially* be a source of generated traffic and more importantly provides the major component of GRDP. The analysis has been undertaken using current data and sources.

A3.2 Background

A3.2.1 Main Minerals

Mineral exploitation in the eastern DRC can be divided between two main types of production:

- Gold – alluvial or in lode deposits – represents most of Ituri's production (Orientale Province) and also found in many North and South Kivu sites; and
- Various metals which make up the composite minerals in the tin group – the "3Ts" – Tin, Tungsten and Tantalum.

In the DRC, **Tungsten** is known as wolfram/wolframite. **Tantalum** is present in Colombotantalite (commonly known as ***Coltan***) which also contains varying proportions of niobium. The composition of the ore varies according to the sites.

Coltan and **Tin** (Cassiterite) are often found together, but *Coltan* can also be found with tungsten.[31]

The interest in one or another metal depends on demand: in 1999-2000, Tin (cassiterite) was merely a not very valuable by-product of Coltan (Tantalum). At present, the opposite is true.

The ores also always contain Iron, which is regarded as an impurity. The Iron requires processing to separate out, to arrive at a sufficient concentration of tin (55 percent, if possible). Thereafter the Tin ore can be sold at a good price.

For the purposes of this Annex, the Tin Group minerals are referred to as **Tin**, **Coltan** and **Tungsten**. The Tungsten deposits tend to lie outside the area of influence of the RITE2 program roads.

A3.2.2 Type of Mining and Effect on Livelihoods

Artisanal mines are widespread, and in most cases the product is hand-carried along forest tracks for aggregation for marketing and export. In comparison with other mining areas of DRC (such as Katanga, where there are many large copper mines), mining in the Kivus is dominated by artisanal mining. The distinction between artisanal and industrial mining is an important one.

The artisanal mining (ASM) of cassiterite, coltan and tungsten generally produces wide-spread, locally centred, and low traffic volumes. On the other hand industrial scale mining (for instance of copper) typically produces very high traffic volumes of point to point traffic. In the case of copper, rail lines are needed to transport bulk ore from mine to consolidation points or smelters.

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Perhaps 3 percent of the DRC population is directly dependent on the extremely arduous, hazardous, and precarious activity of artisanal mining for their livelihood. Allowing each miner five dependents, it can be assumed that up to one fifth of the population probably survive through ASM. When the ubiquitous middlemen and associated businesses are considered, artisanal mining emerges as one of the most important elements of the Congolese economy.

Throughout the DRC many rural people face dwindling livelihood choices in an increasingly marginal environment and hence ASM has become a real option. To those not familiar with the hardships and realties of ASM, the lure of winning 'valuable rocks' from their lands and rising above subsistence levels is very appealing, and many desperate rural and urban people continue to flock to the ASM sites to seek their fortune. However, despite the richness of many of the ASM sites and the apparent productivity of some miners (*orpailleurs, diggers* or *creuseurs),* the vast majority continues to live in poverty. The excessive formal and illegitimate 'taxes' levied on production means that the miners and labourers receive very little daily pay, and most also become trapped, either through debt-bondage, or because they have travelled far and abandoned their homes and farms and have no means to return to their previous livelihoods or seek an alternative source of income.

Although the range of minerals exploited by artisanal mining in the DRC is highly varied, it still encompasses all the typical dangerous practices seen elsewhere such as unstable open pits, unsupported deep shafts and galleries where diggers may remain underground for days, child labour, rapid and high levels of migration between sites with significant community impacts, social disruption, environmental devastation, health concerns, debt-bonding, *et cetera*. Despite these challenges, the ASM sector does have the potential to economically empower disadvantaged and vulnerable groups and contribute to the Congolese development strategies. There is ample anecdotal evidence from the many mining areas throughout the country that on a local level ASM does provide a means of wealth creation, could provide decent work, and certainly stimulates demand for imported and locally produced goods and services and various types of infrastructure through the re-investment of direct proceeds from the ASM activity.

A3.2.3 Conflict and Security

The popular 'resource curse' hypothesis is regularly used to depict the mining sector of the DRC. The UN Security Council and numerous NGOs (including *Global Witness, International Crisis Group, Human Rights Watch, Oxfam, CAFOD, Pole Institute, International Alert, et cetera*) have all researched and catalogued the clearly identifiable links between mineral exploitation and a variety of social and security issues ranging from blatant plundering and looting, to criminal cartels, racketeering, civil instability, violence, and human rights abuses particularly during the war years.

During the war, many ASM sites in the eastern provinces (Orientale and the Kivus) were controlled by the belligerents and militia who forced Congolese men, women and children to undertake extensive mining in dangerous conditions that were profoundly abusive of their human rights. The relationship between mineral exploitation, the use of forced labour, and the continuation of the war in eastern DRC came to global attention following investigations by the UN Panel of Experts (2000-2003) and the efforts of humanitarian and conservation organisations to highlight the plight of people and wildlife in the war-torn region. The problems of insecurity in the artisanal mining areas continue today.

Clearly, if not managed carefully, continued development of roads could exacerbate these negative aspects of ASM. It is hoped that improved access to the new centres de négoces will support the development of traceable supply chains that comply with due diligence requirements and which could help swing the balance more in favour of legitimate trade.

A3.2.4 Mining Geo-economy

The present minerals trade in the DRC is based on a multimodal system of communication, which includes porterage, road and air transport. It reveals a regional geo-economy that is firmly turned towards East Africa. Border towns or those near the border, such as Goma, Bukavu, Uvira, Beni, Butembo and Bunia where trading agencies are set up – create a bridge between the informal upstream chain and the downstream linked to the circuits of the globalised economy.

The trade in minerals contributes to the informal economic integration of the Great Lakes Region and demonstrates a clear separation between politics (within the framework of national sovereignty) and economics (within the system of integrated trade in East Africa). Congolese minerals are exported through official trading networks that transit through Burundi, Rwanda and Uganda. It is reported that minerals are also smuggled across the eastern borders of these three transit countries and the origin of the exported minerals is systematically concealed. The minerals follow the same commercial routes as other merchandise and are part of cross-border trade. A degree of specialization in the commercial routes exists, corresponding to political and, above all, economic considerations.

It is noted that The Kivus are not only production areas, but are also exit routes for minerals that come from deep within Congolese territory in Orientale Province, Maniema and North Katanga. Border towns or those close to the borders, where the comptoirs are located, have fulfilled an important role in the system of commercial trading. As part of the process for providing traceability and transparency, centres de négoces are being constructed where the products of certified legitimate (conflict-free) mines within a 20 to 30 kilometre radius can be sold on for export and tax collected. Four centres de négoces have been built whilst a fifth is to be constructed.

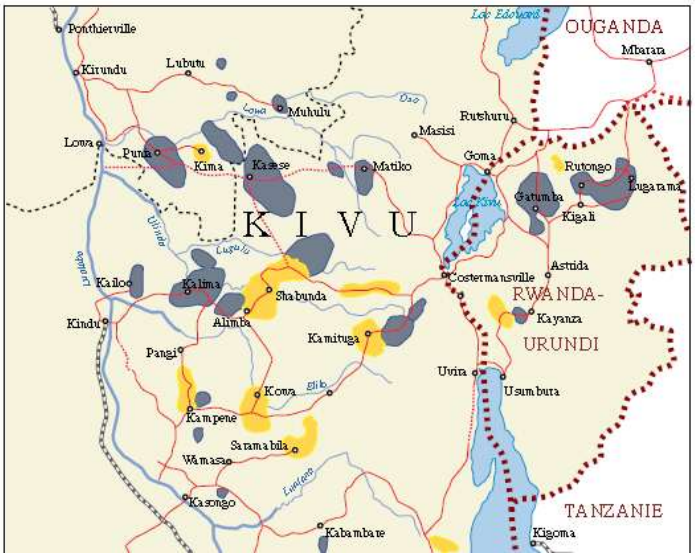
Following the improved accessibility which the road interventions will bring, there will be an opportunity to strengthen the Government system of centres de négoces thereby helping to legitimise the trade in minerals.

A3.3 Principal Mine Locations in the Kivus

A3.3.1 Location Maps

Several different map sources have been referred to, a mixture of the old and the very recent. The primary objective has been to identify major mine sites within the Influence Area of the RITE2 program roads. The first source identified the principal mining areas in the former times (1945) as indicated in Figure A31.

Figure A31 Tin and Gold mining areas in Eastern DRC Rwanda and Burundi

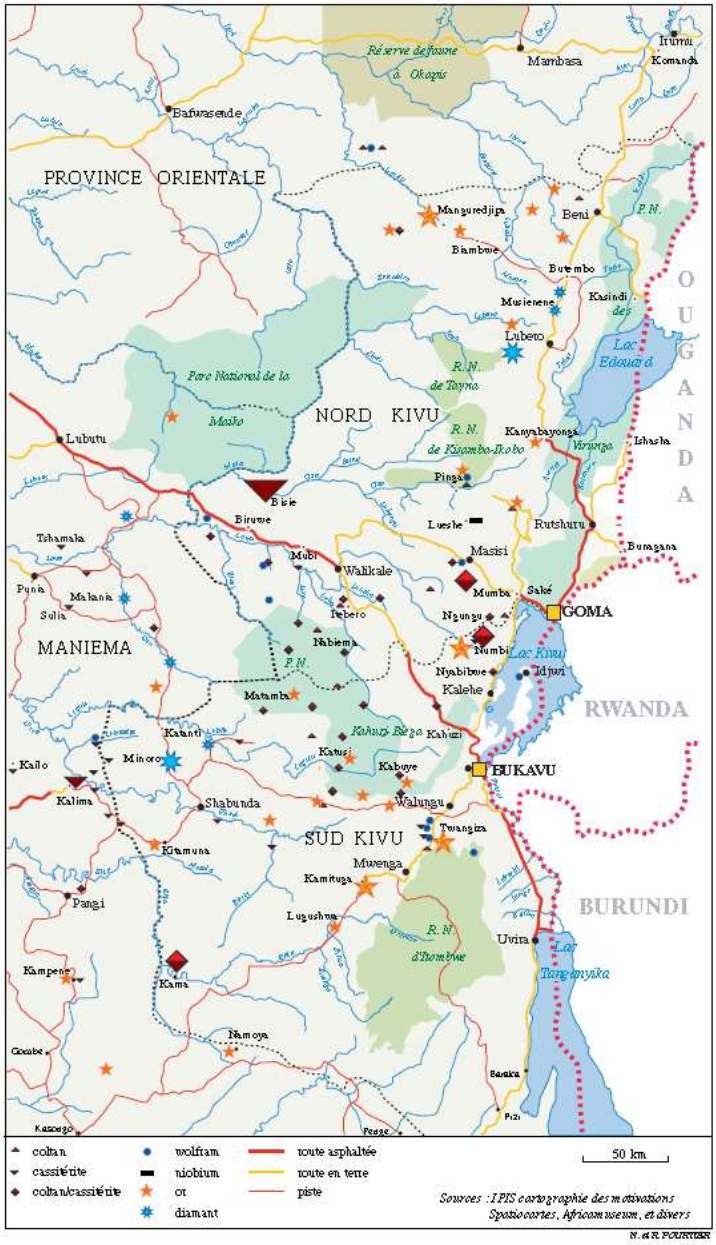


Legend

Source: Belgian Congo. Tin mining areas - US Department of the Interior, Mineral Resources 1945

The substantial tin and gold mineral deposits in the Kivus are apparent. Three program roads in RITE2 are centrally located within the known Kivu deposits of tin (*étain*) and one program road (Burhale- Shabunda) is located within the known deposits of gold (*or*). The Shabunda- Burhale route can be associated with gold traffic and the Bukavu- Walikale- Masisi- Sake routes with predominantly tin and coltan traffic. A second source identified sites of mineral exploitation in the Kivus as indicated in Figure A42.

Figure A32 Mine sites in the Kivus by Type



Although gold and diamond mining is widespread in South Kivu, North Kivu indicates a wider range of mineral type and in particular has rich resources of tin and coltan (the Tin group). Diamonds are located to the west of the RITE2 program roads. Tungsten mines are less widespread and only one mine appears within the road influence area (in North Kivu).

Key mining areas in the Kivus and Maniema include Bunia, Kalima, Lugushwa, Masisi, Walikale, Kamituga and Mwenga, with most mining rights previously held by the state company *Société Minière et Industrielle du Kivu (SOMINKI)*. These minerals occur in streambeds, alluvial deposits and soft rock, and are easily extracted by artisanal mining methods.

A3.3.2 North Kivu mining sites

Most of the tin Group sites are located in the "Little North", which includes the **Walikale**, **Masisi**, Rustshuru and Nyiragongo territories[32]. This is the richest region, especially Walikale (Table A31), but is also the most complicated area of the Kivus, since all the tension-creating factors – land ownership, demographic, ethnic, economic and military – are concentrated there. In 2007 and 2008 this area was at the centre of the armed conflicts.

Table A31 Principal Minerals in North Kivu

Province	Name of Mining Area	In RITE2 Influence Area?	Production Mineral and amount	Amount tons/ kilos	Number of Miners	Price per Kilo	Comment
North Kivu	Bisié	Yes north of Walikale	Tin	10,000	Estimate for Province: 200,000	Tin US$2,858/ Kilo	of relevance to the Sake-Walikale route and the Nyamirera- Walikale route
	Itebero	Yes south of Walikale	coltan tin			Coltan US$ 520 /kilo Tin US$2,858/ Kilo	of relevance to the Nyamirera- Walikale route
	Mumba Bibatama	Yes south of Masisi	coltan tin tungsten			Tungsten US$50/kilo Coltan US$ 520 /kilo Tin US$2,858/ Kilo	of relevance to the Sake-Walikale route
	production of Tin in North Kivu estimated as :			14,000			
	Lueshe	Yes north of Masisi	Niobium			Niobium US$46/kilo	of relevance to the Sake-Walikale route
	Fatwa Kasugho	No near Beni	Diamonds				Very high value- does not require road access
	Musuienene	No near Lubero	Diamonds				Very high value- does not require road access
	Manguredjipa	yes near Numbi?	Gold			Gold US$ 54,000 /kilo	Very high value- does not require road access

Source; www.international-alert.org 2010 publication with the help of the European Union.

The largest mining site is at Bisié in Walikale territory. This exceptional deposit produced 70 percent of the Tin exported from Goma. In April-December 2007, the four production sites had 1,732 workers. Other important Tin and Coltan mines are located at Itebero and Mumba Bibatama. Total production of tin for the whole of North Kivu was estimated at 14, 000 tonnes. Allegedly 75 percent of coltan within the DRC occurs within and around Kahuzi Biéga National Park which has created concerns regarding the destruction of the environment and protection of endangered species.

In many cases it is difficult to locate the mines on a map. In its study on '*Coltan and the people of North Kivu'*, the Pole Institute refers to a great number of mining sites (about thirty) in the Masisi, Kalehe and Walikale territories, without indicating where exactly they are found, especially since the names of villages vary from one map to another. "Mining foyers" are referred to south of Walikale, near Itebero, but without any further details about where the "hills" Nkuba and Kakelo are to found. The Pole Institute also mentions exploitation sites to the north of the Kahuzi Bieza National Park

32 The latter two areas lie outside the influence area of the RITE2 Program Roads.

(PNKB), but those cannot be found because of the absence of any geographical indicators although the map references may help. The Atlas of the Administrative Organisation of the Democratic Republic of the Congo is of little assistance, since in the studies consulted, the mining sites are seldom cross-referenced with groupings or local government areas they are part of. Lueshe, the only industrial site in North Kivu, specialises in processing pyrochlore (niobium) and does not appear on IPIS maps, or on satellite maps, or on any of the general maps of the DRC. It does, however, appear on the 1988 map of the Republic of Zaire. This disappearance of Lueshe is surprising. (The mine site appears to be located to the north of Masisi).

A3.3.3 South Kivu mining sites

The mining sites can be divided into two groups: minerals of the tin group which are located in the north of the Province and minerals such as gold and diamonds which are located to the south and west (Table A32).

Table A32 Principal Minerals in South Kivu

Province	Name of Mining Area	In RITE2 Influence Area?	Production Mineral	Amount tons/ kilos	Number of Miners	Price per Kilo	Comment
South Kivu	Numbi	Yes near Masisi	coltan tin tourmaline	unknown	unknown	Coltan US$ 520 /kilo Tin US$2,858/ Kilo	Fairly close to Goma/ link end point
	Nyabibwé	Yes south of Saké	coltan tin	unknown		Coltan US$ 520 /kilo Tin US$2,858/ Kilo	Fairly close to Goma/ link end point
	Kama	No south of Shabunda	coltan tin				
	Kamituga	no Mwenga	Gold				Very high value- does not require road access
	Twangiza	no Mwenga	Gold				Very high value- does not require road access
	Lugushwa	no Mwenga	Gold				Very high value- does not require road access
	Minoro	Yes north of Shabunda	Diamonds	unknown		na	Very high value- does not require road access

Source Metal prices Mining Sector News Libertas November 4, 2011

Source 2; www.international-alert.org 2010 publication with the help of the European Union

It was estimated that there were 150,000 miners in South Kivu in 2007[33]. In South Kivu tin mines are located along the routes from Bukavu to Walikale and from Bukavu to Goma. The Nyabibwé mine (Tin-coltan) is to the south of Saké. An important mining centre in Numbi (coltan, Tin and tourmaline) lies on the boundary between North and South Kivu. The NGO Vision Verte has mapped sixty-some coltan mines inside the Kahuzi Biega National Park. The gold-bearing area of South Kivu comprises three main areas, Twangiza, Kamituga and Lugushwa, which form the “Golden Furrow” to the south-west of Bukavu. Alluvial gold has been mined since the 1920s around Kamituga, gold in lode deposits from a later date. These areas are to the south of the RITE2 program roads. South Kivu (Kamituga) and Maniema have many gold ASM (called *orpaillage*) sites.
There are an increasing number of diamond exploitation sites in the Kivus IPIS has noted that there is significant production in the Shindano mine, near Minoro (north of Shabunda).

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A3.4 Volumes: Estimates of Mine Production in the Kivus

A3.4.1 Historical Production Volumes

Mining only became important in the Kivus from the 1920's.The annual reports on economic affairs in the Kivus provide interesting production figures when compared with current evaluations. Peak production of Tin reportedly occurred in 1945 with some 12,000 tonnes produced in that year (Table A33).

Table A33 Gold and Tin production during the colonial period

Mineral	1935	1940	1945	1950	1955	1959
Gold (kg)	2954	6269	3174	2397	2107	3449
Tin (t.)	1200	5250	12110	8383	11379	6074

A3.4.2 Mineral Exports

Researchers attempting to quantify the volumes and value of minerals turn to various indirect methods including estimating the number of flights by small transport aircraft serving the mining areas, on the basis that they carry 2 tonnes on each flight. In the 'little north' of Kivu the most valuable mineral has been Tin (Table A34). Between 1999 and 2001, a 'coltan phenomenon' occurred; remarkable both for its intensity and its short duration. Before 2000 the DRC was not even present in published world tantalum statistics, when suddenly it shot into second place with over one seventh of total world production; with the Kivu and Maniema provinces providing practically all of it. Production dropped off again rapidly over the following few years, alongside a worldwide slump in the market. In May 2005 a *CTPCM* report on coltan concluded that 81 percent of the revenues generated go to external actors, bypassing the desperate ASM communities. At the peak, an estimated 100,000 *creuseurs* were involved with coltan, including an estimated 12,000 in the PNKB who could produce a kilogram a day, worth USD80 in 2000. Today these *creuseurs* and porters make far less.

Table A34 Mined mineral exports from North Kivu in 2006 (OFIDA)

Mineral	Weight	Proportion	Value in US$	Av. Value / ton
Cassiterite t	2968	84.8%	7065123	2380
Wolframite t	483	13.8%	1063567	2202
Coltan t	41	1.2%	217558	5306
Niobium t	8	0.2%	17136	2142
Gold kg	9		109918	

Source; www.international-alert.org 2010 publication with the help of the European Union

A second estimate of mineral exports in 2007 and 2008 was undertaken. (Table A35).

Table A35 Export of minerals from Kivu, 2007 and 2008 (in tonnes)

Mineral	2007	35%	2008	35%
Tin	13656	18436	18216	24592
Tungsten	1095	1478	652	880
Coltan	267	360	383	517

Source; www.international-alert.org 2010 publication with the help of the European Union

Tin exports alone amounted to an estimated USD 60 million in 2008. The Pole Institute has produced estimates covering a longer period (1999-2006) that show production trends for each mineral: the temporary boom of coltan, the spectacular rise of tin, and more recently of tungsten, and the collapse of niobium in Lueshe. The figures in Table A46 are thought to be far from reflecting real production volumes, because of widespread fraud.

Table A36 Production trends for each main mineral

Year	Tin	Coltan	Tungsten	Niobium
1999	71	5	5	
2000	23	15	15	22
2001	550	90	28	605
2002	497	28	28	1339
2003	938	26	26	670
2004	4672	42	42	386
2005	3599	26	26	91
2006	2909	39	401	9

Source: Pole Institute, 2007

In summary the most significant mineral is Tin, followed by Tungsten. The annual volumes of export Tungsten (in the range 400- 1500 tonnes) are centred in North Kivu at Mumba Bibatama south of Masisi. As mentioned above the production of tin in North Kivu is centred on the main Bisié mine-site and tin production volumes for the province vary between 3000 tonnes to 25,000 tonnes , the latter which is thought to be about twice historical volumes.

A3.5 Present Tin and Coltan transport arrangements inside DRC

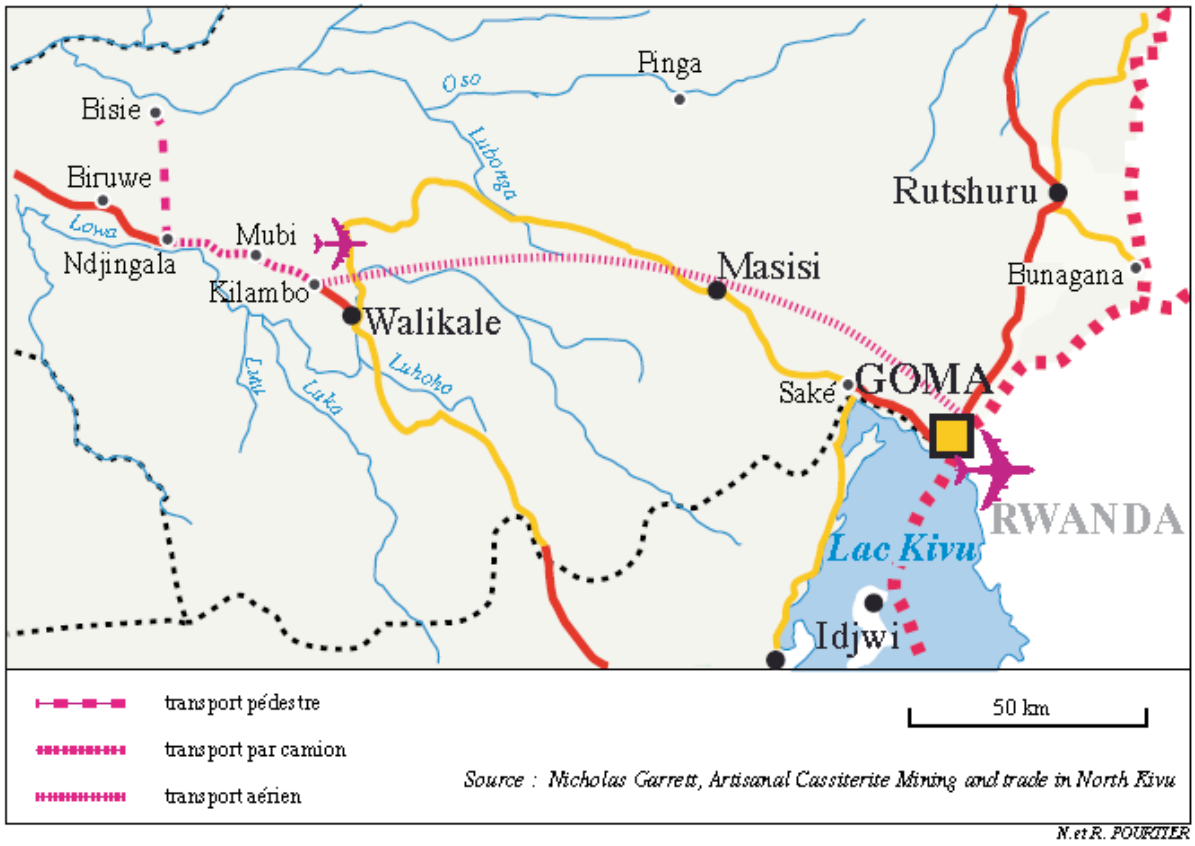
Gold and Diamonds are characterised as ‘high-value, low- bulk’ minerals. Transport arrangements for these commodities are therefore relatively unconstrained by the availability of road networks as transport cost is not a very important element in the final market price for gold and diamonds. Whereas the Influence Areas for high value minerals could be very wide and probably only existence of access tracks and local airstrips are sufficient, where mineral deposits are of much lower value (:Tin is less than one twentieth the value of gold per kilo), for tin, niobium and tungsten local all-weather roads become more necessary for export purposes.

A3.5.1 Mineral Transport in North Kivu

The principal Bisié tin mine-site is isolated in the forest (Figure A33) with no road linking it with the Goma-Kisangani highway (which is not wholly passable). The path which is most used to reach the highway route runs 45 km from the village of Manoiré (in the middle of the mining zone) to Ndjingala. The ore is carried on the backs of porters in 50 kg sacks and the trip takes 16 hours. Human porterage is often the primary means of carrying mineral ores. Bicycles and tchukudu are used wherever there is a viable path.

Once it arrives in Ndjingala, the ore is taken by truck to the improvised landing strip on a section of the tarred road in Kilambo, where small cargo aircraft carry 2 tonnes per flight. At the height of the Coltan boom, there were around 7 to 10 flights a day between Mubi and Goma.

Figure A33 Transport of Tin Group minerals from Bisié to Goma



Source; www.international-alert.org 2010 publication with the help of the European Union

Other mining sites are more or less easily accessible by road and their location can be established precisely, for example in Masisi, known mainly as an agro-pastoral area before the war, but which also has several mining carrés [squares]. The annual volumes of export Tungsten (in the range 400-1500 tonnes) are centred in North Kivu at Mumba Bibatama south of Masisi.

A3.5.2 Mineral Transport in South Kivu

The most accessible mine sites in South Kivu are located along the main road routes from Bukavu to Walikale and from Bukavu to Goma. The Nyabibwé mine (Tin-Coltan) is located to the south of Saké, along the road remade by “Agroallemande” (Welthungershilfe). The important mining centre of Numbi (coltan, Tin and tourmaline) lies on the boundary between North and South Kivu and is very difficult to access.

A landing strip at Lulingu in South Kivu was used for exporting a large part of the Coltan from Kahuzi Biega during the boom. The western part of the Kahuzi Biega National Park, which straddles South and North Kivu, was invaded during the Coltan boom. The eastern part around Mount Biega has remained more protected. It is expected that the Burhale-Shabunda route upgraded by DFID under the RITE1 program has facilitated the transport of minerals along the axis towards Burhale and Bukavu. Kamituga, about 180 kms to the south-west of Bukavu, became impossible to reach by road so that airplanes replaced trucks to supply an urban centre with more than 10,000 inhabitants.

Air transport has played a major role in the domestic minerals trade, since some sites are completely isolated. There are 10 airstrips within the RITE2 Road Influence Area.

A3.6 Estimate of Road Traffic Generated by the Main Mines

The traffic analysis concentrates on the ‘lower value, higher bulk’ minerals: Tin, Coltan and Tungsten. The focus of the estimation is on the export of minerals by road within the Influence Area. The mineral

trade in the DRC has traditionally depended on a multi-modal transport system combining porterage, roads and aircraft. It is likely that significant road investments within the ZoI will reduce the final leg (the transport of low value minerals by air) in most cases.

A3.6.1 Assumptions

Given that there is great uncertainty about present levels of mineral production; estimates of future mine related road traffic are correspondingly uncertain, providing *orders of magnitude* only.

It is assumed that mining within the Influence Area will continue to focus on Artisanal Mining (ASM) and that no large new deposits of Tin, Tungsten and Coltan will be found within the coming five year period. If a large new deposit of Tin or other mineral will be mined industrially within the coming five year period this could have a significant local impact on RITE2 road program traffic in due course. The extent of mine traffic would depend on where the mine is located and the value of the commodity being mined. It is noted however that industrial mining usually requires significant lead times, since many permits and registrations are needed before mining can commence. Hence, even if industrial mining is identified for a particular site within the Road Influence Area in the coming years, it would be unlikely that mining would commence very quickly.

The actual tonnage of materials transported is less important than the potential for a change in the nature of the trade – although that should indeed be associated with an increase in tonnage, and also its value per kg as it becomes acceptable again on international markets. Indicative marker prices for minerals are provided in Annex A3 Sub annex 3.1 below.

A3.6.2 Tin Traffic

As mentioned above the transport of tin in North Kivu is centred at the main Bisié mine-site. In principle the ore could be moved by small truck from Ndjingala all the way to Walikale – Masisi- Sake-Goma, once the DFID funded Walikale- Masisi route has been improved.

The cost of trucking tin from Ndjingala to Goma would be cheaper, on a ton-km basis, than by utilising small cargo aircraft. (The first and most cost-effective solution would be to build a motorised mine access track between the Bisié mine-site and Ndjingala, outside the RITE2 Influence Area).

Current estimates of tin production have identified a *possible* volume of some 25,000 tonnes per annum; approximately double the 1945 volume. The volumes of artisanal tin to be transported by road or by other transport means are still rather small. Assuming a truck with 10 ton carrying capacity, year round production of tin and road transport from Ndjingala to Goma, an *average* daily truck volume from Ndjingala would be in the order of some 7 vehicles a day. If the production were to be at historical levels then only some 3-4 mine tin trucks a day would travel the route. It is expected that, following improvement to the Walikale- Masisi road route, transport of tin from the Bisié mine to Goma would be by road transport rather than air transport, unless significant security problems remain along parts of the road corridor.

There may also be some tin traffic generated by the mines near Itebero. This is reportedly a much smaller deposit than at the main Bisié mine-site. Hence export volumes by any transport mode are likely to be much lower than Bisié. If the program roads are upgraded simultaneously, a small amount of export tin traffic is likely to travel by road, either south of Itebero to Bukavu, or alternatively via Walikale- Masisi- Sake to Goma. The important mining centre of Numbi may *not* achieve significant improvements in road access under the RITE2 program, since all of the three RITE2 routes proposed for improvement lie some distance away from this mining area. The market centre of Goma lies close by to Numbi, towards the East.

A3.6.3 Coltan Traffic

Road traffic of Coltan is more difficult to predict. Firstly, mineral deposits appear to be more widespread, including many small deposits in the PNKB. Thus many of these mines would experience an increase in accessibility and would be able to use road transport year round on an improved road network. However, as noted most Coltan deposits are small and widely distributed throughout the

influence area and therefore economies of scale (large volumes at specific sites) will not be possible. A further factor is due to fluctuations in Coltan prices.

Although world market prices are high (at around US$500 per kilo) the value of DRC production is currently far less than these figures because of the “conflict minerals” issue. There is worldwide restraint on Coltan buying from DRC (so-called ‘Blood Coltan’) hence future production volumes and therefore traffic remains unpredictable.

Although coltan has been linked with conflict e.g. through the “Blood in the Mobile” campaign, tin is just as much associated with the funding of conflict, and the demand for all artisanal mineral production from DRC (not just coltan) has gone down e.g. as a result of the US Dodd Frank Act and other due diligence measures (e.g. OECD) that are starting to be adopted by companies.

Thus, the unpredictability applies to all artisanal minerals, but the hope is that the roads have a role to play in supporting the development of traceable supply chains that comply with due diligence requirements (rather than just e.g. helping the smugglers get their production over the border into Rwanda).

On the basis of the known deposits and sector arrangements it is probably reasonable to assume that an annual production volume of some 500 tonnes would be possible within North Kivu and that this production will continue to be widely spread. Most of the tonnage is expected to travel on the three RITE2 roads in North Kivu. Clearly this amounts to a very small tonnage of daily traffic (in the order of 1.5 tonnes per day).

A3.6.4 Tungsten Traffic

Volumes of export Tungsten are expected to be in the range 400- 1,500 tonnes per annum centred in North Kivu at Mumba Bibatama mine to the south of Masisi. Based on current mapping this mine traffic would be expected to access the Masisi- Sake – Goma highway at some point, *en route* for marketing in Goma. This tungsten traffic is likely to travel only on a small portion of the Masisi- Sake route. Traffic volumes are very small (and the commodity price is low).

A3.6.5 Gold and Diamond Traffics

Precious minerals such as gold and diamonds are attractive as they have the advantage of being relatively simple to extract, refine, and transport.

Despite the historical deterioration of roads within the Kivus, and indeed a complete absence of roads in some areas, it is known that these high value mineral ores have been transported over great distances. According to the CEEC branch in Butembo, gold traded there comes mainly from Orientale Province (and from Ituri in particular), from North Kivu (Lubero, Beni, Walikale), from South Kivu, but also from Katanga and from Equatorial Province. Given the continued high prices for Gold and Diamonds and the need for very high security in diamond/gold transport, the current air transport arrangements (from local airstrips near mine sites to markets at Goma and Bukavu) are expected to continue.

A3.7 Estimate of Road Traffic Generated by Mine Support Activities: Importance of the centres de négoces (CDN’s)

A3.7.1 Mine Support- Local Mine Ingress improvements

There is some doubt over the ability of the RITE2 road investment program to capture a significant share of the *outgoing* high value mine output traffic by road mode. However for *incoming* mine sector support, mine supplies and Government assistance to artisanal mine development a significant share of such traffic is expected to be by road. A large proportion of the Kivus is expected to gain improved road access under RITE2 which could strengthen the Government system of Centres de Négoces.

A3.7.2 Mine Support- Establishment of the Centres de Négoces

As part of the process for providing traceability and transparency, centres de négoces are being constructed where the products of certified legitimate (conflict-free) mines within a 20 to 30 km radius can be sold on for export and tax collected. Four centres de négoces have been built so far as shown

in figures A34, A35 and A36, at Itebero, Isanga, Rubaya and Mugogo, whilst a fifth is to be built at Numbi.

The first two centres Isanga and Itebero are currently unable to operate because of security problems. The Itebero centre is also accessible only by motorbike due to the poor state of the roads, rendering it effectively non-operational.

Rubaya is awaiting the resolution of land title problems, whilst Mugogo lies within the Banro gold concession and agreement will need to be negotiated for its operation. RITE2 Link 1 (Nyamirera-Walikale) is close to Itebero and Isanga CDN's. RITE2 Link 4 (Walikale- Masisi) is located close to Rubaya CDN. RITE2 Link 2 (Kasheke - Kando) is located close to Numbi CDN.

It is expected that once the centres de négoces become operational, the RITE2 roads program investments will assist to permit much greater control over legitimate minerals. Although it is clearly impossible to forecast CDN related traffic within the Road Influence Area with any degree of accuracy, perhaps a fair assumption would be that road traffic in the order of 1-5 vehicles a day would be generated along the two main road routes in North Kivu as a result of Local Governance improvements associated with establishing and servicing the CDN's.

Figure A34 Location of Centres de négoces: North Kivu

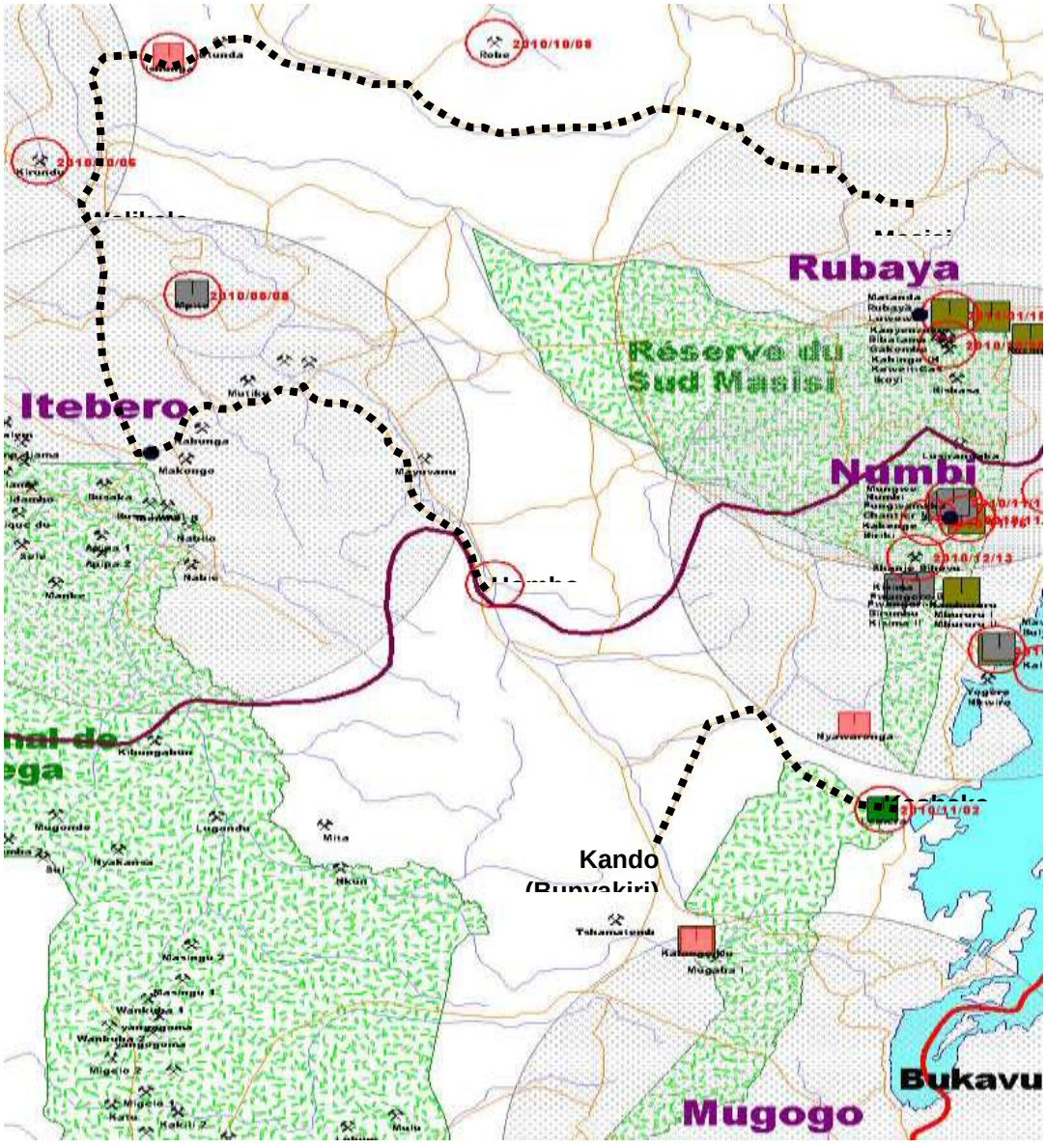


Figure A34 indicates that the Hombo-Walikale-Masisi road connects Itebero, Isanga (via an existing road through Kirundu) and Rubaya to Bukavu and Goma.

Figure A35 Location of Centres de négoces: Itebero and Isanga

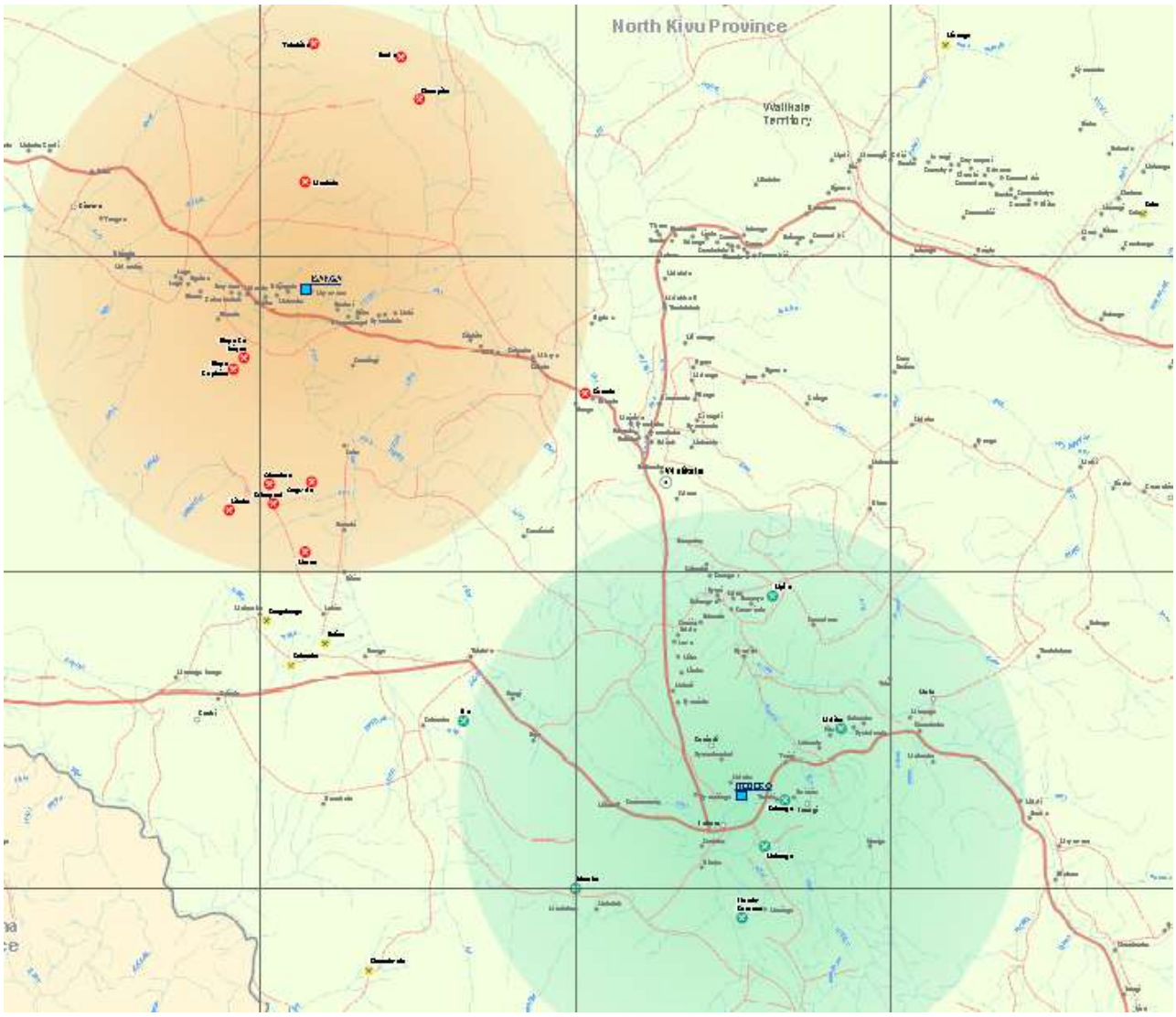
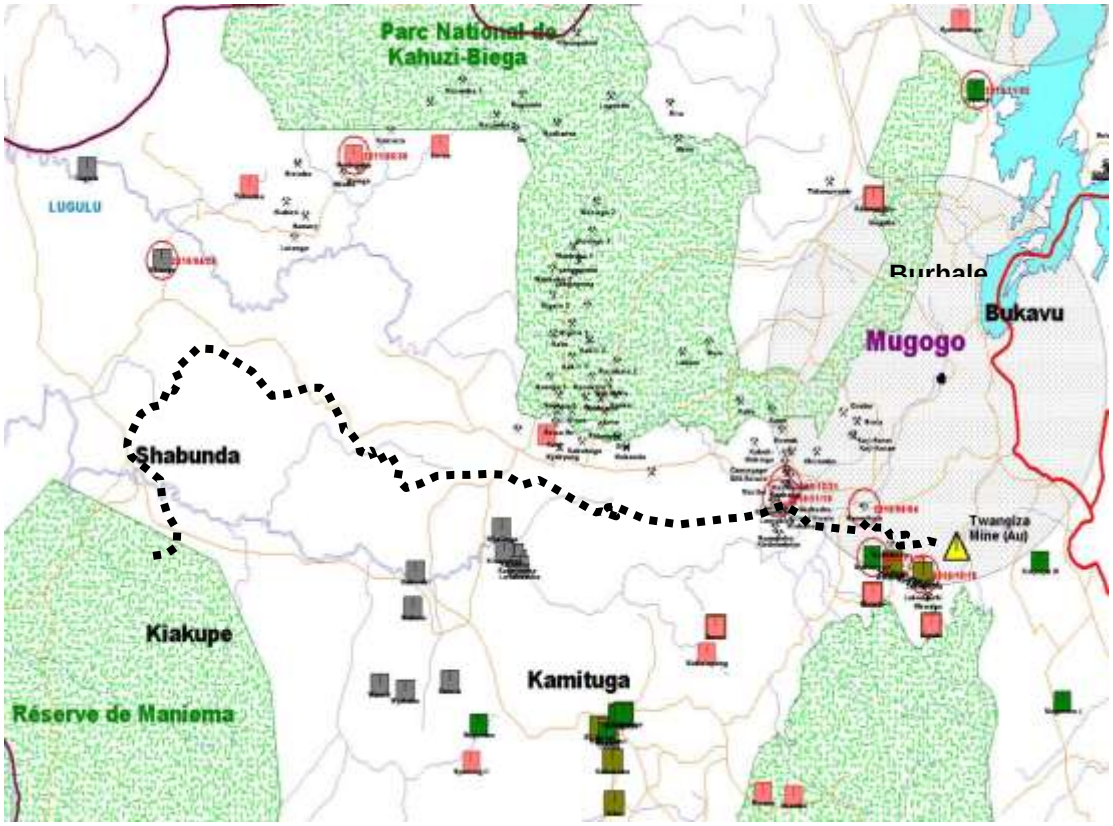


Figure A35 indicates how the Nyamirera - Walikale road route and the Walikale- Masisi road route connect Itebero and Isanga CDN's to Bukavu and Goma. The RITE2 road program improvements in North Kivu are ideally timed to support the establishment of these two CDN's.

Figure A36 Location of Centres de négoces: South Kivu



Although seemingly of lesser significance for the establishment of the centres de négoces, the Burhale-Shabunda road (Figure A46) is expected to improve the access to Bukavu for several areas of mining activity (as indicated by the symbols on the maps), although some of these lie close to the PNKB.

A3.7.3 MONUSCO Operational Strategy

MONUSCO's Stabilisation Support Unit believes that the RITE2 roads program would permit the centres to become operational, specifically through facilitating:

- Deployment of trained centre de négoces personnel;
- Deployment of police to protect the sites and allow supplies to reach them;
- Opening up of mineral-rich areas, allowing better control of mineral exploitation (such as working conditions, child labour and environmental protection);
- Creation of poles around which economic development can be relaunched, for example through agriculture and the creation of markets[34].

A3.7.4 DFID – World Bank Operational Strategy

The DFID-World Bank Promines project includes a component for supporting the supply of certified and traceable legitimate minerals in Eastern DRC, which could include the establishment of further

34 The impact on agricultural development would need to be assessed in a study by an Agricultural Economist.

centres de négoces. The proposed RITE2 road program is therefore potentially complementary to Promines, and does not preclude any of its options.

A3.7.5 Trade and Business Climate

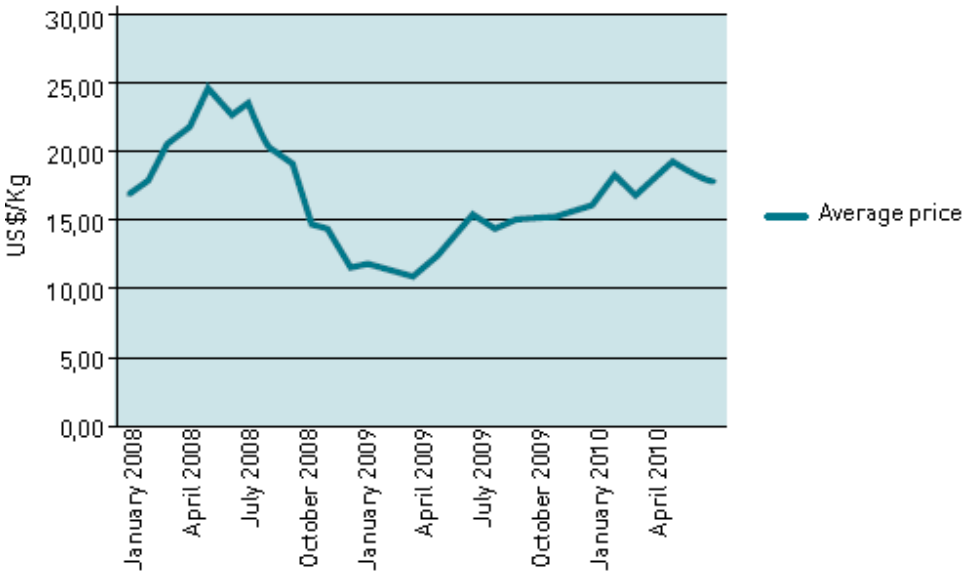
DFID plans interventions in both trade and improvement of the business climate, but details have yet to be determined. The Kivus are very high on the trade and business climate agenda but, the complementarity of individual link interventions cannot easily be identified. Nevertheless, in general terms the RITE2 road improvement program is expected to be beneficial to trade and the business climate of the area. This is particularly so in the case of the two Hombo-Walikale and Walikale-Masisi routes, which not only have local significance as part of the stabilisation effort, but which also jointly complete the main strategic highway links between Goma and Bukavu and Kisangani (and hence to Kinshasa via the Congo River). If a trade intervention included improvement of the Goma and Bukavu border crossings, the route interventions on the Hombo-Walikale and Walikale-Masisi routes might be complementary.

A3.8 Estimate of Road Traffic Generated by Mine Support Activities: Mine Supplies

The sustainable improvement of the miners' economic situation does not depend only on increasing their income, but also and above all on rebuilding transport infrastructure, as it is key in connecting rural areas to markets; it was the disappearance of road traffic that transformed these mine areas into enclaves. The impact of the extraordinarily high cost of transport on consumer goods weighs heavily on the personal budgets of the miners and the associated mine workers, who must bear the expenses of isolation. SOMINKI used to buy part of local food crops to feed its workers. In the past, good roads played a role linking buyers and sellers. A return to a formal economy is therefore only conceivable if the road transport infrastructure is improved within the Zone of Influence. Although it is clearly impossible to forecast consumer goods sales at mine sites within the Road Influence Area as a result of road network improvement with any degree of accuracy, perhaps a fair assumption would be that road traffic in the order of 2-3 vehicles a day would be generated along the main road routes in North and South Kivu as a result of greatly improved passability and reduced vehicular travel costs.

Annex A3 [Sub Annex A31] Tin (cassiterite) and Coltan Prices World market prices (USD)

1. Evolution Tin (cassiterite) price



Source: London Metal Exchange (LME)[35]

2. Evolution Coltan price

Source: www.asianmetal.com[36]

35 Prices are in current USD, cash price. Note: the spot price of Tin Coltan is around USD 25,000 per kilo hence prices have risen over the period 2010- 2011.

36 Note: the spot price of Coltan is around USD 500 per kilo hence prices have risen considerably over the period 2011- 2012.

A4 APPRAISAL RESULTS BY ROUTE

RITE Phase II
Economic Internal Rate of Return
Sub-project: Nyamirera- Walikale

Table 1

($)

Year	Incremental Cost		Incremental	Net Costs	Sensitivity Analysis				
	Capital	O&M	Benefits	and Benefits	Case 1	Case 2	Case 3	Case 4	Case 5
2012	0.89			-0.89	-0.98	-0.89	-0.89	-0.89	-0.89
2013	1.34			-1.34	-1.47	-1.34	-1.34	-1.34	-1.34
2014	2.23			-2.23	-2.45	-2.23	-2.23	-2.23	-2.23
2015	0	0.09	1.18	1.09	1.09	1.08	0.97	0.96	-0.09
2016	0	0.09	1.18	1.09	1.09	1.09	0.98	0.97	1.09
2017	0	0.09	1.19	1.10	1.10	1.09	0.98	0.97	1.09
2018	0	0.09	1.20	1.11	1.11	1.10	0.99	0.98	1.10
2019	0	0.09	1.20	1.11	1.11	1.10	0.99	0.98	1.11
2020	0	0.09	1.21	1.12	1.12	1.11	1.00	0.99	1.11
2021	0	0.09	1.21	1.12	1.12	1.12	1.00	0.99	1.12
2022	0	0.09	1.22	1.13	1.13	1.12	1.01	1.00	1.12
2023	0	0.09	1.23	1.14	1.14	1.13	1.01	1.01	1.13
2024	1.12	0.09	1.23	2.44	2.25	2.25	2.14	2.30	2.25
EIRR				**19%**	**16%**	**18%**	**16%**	**16%**	**14%**
Net Present Value discounted @ 12% ($)				**1.31**	**0.92**	**1.23**	**0.79**	**0.79**	**0.50**

Base EIRR	**19%**
Sensitivity Analysis - Key Variables	
Case 1 - 10 percent Increase in Capital Costs	**16%**
Case 2 - 10 percent Increase in O&M Costs	**18%**
Case 3 - 10 percent Decrease in Benefits	**16%**
Case 4 - 10 percent Increase in O&M Costs and 10 percent Decrease in Benefits	**16%**
Case 5 - Project Benefits delayed by One Year	**14%**

RITE Phase II Table 2
Economic Internal Rate of Return
Sub-project: Kaseke- Bunyakiri

($)

Year	Incremental Cost		Incremental	Net Costs	Sensitivity Analysis				
	Capital	O&M	Benefits	and Benefits	Case 1	Case 2	Case 3	Case 4	Case 5
2012	0.66			-0.66	-0.72	-0.66	-0.66	-0.66	-0.66
2013	0.99			-0.99	-1.09	-0.99	-0.99	-0.99	-0.99
2014	1.64			-1.64	-1.81	-1.64	-1.64	-1.64	-1.64
2015	0	0.07	0.90	0.83	0.83	0.83	0.74	0.74	-0.07
2016	0	0.07	0.90	0.84	0.84	0.83	0.75	0.74	0.83
2017	0	0.07	0.91	0.84	0.84	0.83	0.75	0.74	0.84
2018	0	0.07	0.91	0.85	0.85	0.84	0.75	0.75	0.84
2019	0	0.07	0.92	0.85	0.85	0.84	0.76	0.75	0.85
2020	0	0.07	0.92	0.85	0.85	0.85	0.76	0.76	0.85
2021	0	0.07	0.92	0.86	0.86	0.85	0.77	0.76	0.85
2022	0	0.07	0.93	0.86	0.86	0.86	0.77	0.76	0.86
2023	0	0.07	0.93	0.87	0.87	0.86	0.77	0.77	0.86
2024	0.82	0.07	0.94	1.83	1.69	1.69	1.60	1.73	1.69
EIRR				**20%**	**17%**	**19%**	**17%**	**17%**	**15%**
Net Present Value discounted @ 12% ($)				**1.08**	**0.80**	**1.03**	**0.69**	**0.69**	**0.47**

Base EIRR	**20%**
Sensitivity Analysis - Key Variables	
Case 1 - 10 percent Increase in Capital Costs	**17%**
Case 2 - 10 percent Increase in O&M Costs	**19%**
Case 3 - 10 percent Decrease in Benefits	**17%**
Case 4 - 10 percent Increase in O&M Costs and 10 percent Decrease in Benefits	**17%**
Case 5 - Project Benefits delayed by One Year	**15%**

RITE Phase II Table 3
Economic Internal Rate of Return
Sub-project: Burhale- Isezya- Shabunda

($)

Year	Incremental Cost		Incremental	Net Costs	Sensitivity Analysis				
	Capital	O&M	Benefits	and Benefits	Case 1	Case 2	Case 3	Case 4	Case 5
2012	0.72			-0.72	-0.79	-0.72	-0.72	-0.72	-0.72
2013	1.44			-1.44	-1.58	-1.44	-1.44	-1.44	-1.44
2014	5.04			-5.04	-5.55	-5.04	-5.04	-5.04	-5.04
2015	0.00	0.14	0.00	-0.14	-0.14	-0.16	-0.14	-0.16	-0.14
2016	0	0.15	1.96	1.82	1.82	1.80	1.62	1.61	-0.15
2017	0	0.15	1.97	1.83	1.83	1.81	1.63	1.62	1.82
2018	0	0.15	1.98	1.84	1.84	1.82	1.64	1.62	1.83
2019	0	0.15	1.99	1.85	1.85	1.83	1.65	1.63	1.84
2020	0	0.15	2.00	1.86	1.86	1.84	1.66	1.64	1.85
2021	0	0.15	2.01	1.87	1.87	1.85	1.67	1.65	1.86
2022	0	0.15	2.02	1.88	1.88	1.86	1.68	1.66	1.87
2023	0	0.15	2.03	1.89	1.89	1.87	1.68	1.67	1.88
2024	0.00	0.15	2.04	2.19	1.90	1.88	1.69	1.97	1.89
2025	1.80	0.15	2.05	4.00	3.69	3.69	3.50	3.78	3.70
EIRR				**17%**	**15%**	**16%**	**15%**	**15%**	**13%**
Net Present Value discounted @ 12% ($)				**1.68**	**1.01**	**1.49**	**0.83**	**0.90**	**0.41**

Base EIRR	**17%**
Sensitivity Analysis - Key Variables	
Case 1 - 10 percent Increase in Capital Costs	**15%**
Case 2 - 10 percent Increase in O&M Costs	**16%**
Case 3 - 10 percent Decrease in Benefits	**15%**
Case 4 - 10 percent Increase in O&M Costs and 10 percent Decrease in Benefits	**15%**
Case 5 - Project Benefits delayed by One Year	**13%**

RITE Phase II Table 4
Economic Internal Rate of Return
Sub-project: Sake- Nyabiondo- Walikale

($)

Year	Incremental Cost		Incremental	Net Costs	Sensitivity Analysis				
	Capital	O&M	Benefits	and Benefits	Case 1	Case 2	Case 3	Case 4	Case 5
				0.00					
2012	1.18			-1.18	-1.30	-1.18	-1.18	-1.18	-1.18
2013	1.77			-1.77	-1.94	-1.77	-1.77	-1.77	-1.77
2014	2.95			-2.95	-3.24	-2.95	-2.95	-2.95	-2.95
2015	0	0.12	1.57	1.45	1.45	1.44	1.30	1.28	-0.12
2016	0	0.12	1.58	1.46	1.46	1.45	1.30	1.29	1.45
2017	0	0.12	1.59	1.47	1.47	1.46	1.31	1.30	1.46
2018	0	0.12	1.59	1.48	1.48	1.46	1.32	1.31	1.47
2019	0	0.12	1.60	1.48	1.48	1.47	1.32	1.31	1.48
2020	0	0.12	1.61	1.49	1.49	1.48	1.33	1.32	1.48
2021	0	0.12	1.62	1.50	1.50	1.49	1.34	1.33	1.49
2022	0	0.12	1.63	1.51	1.51	1.50	1.35	1.33	1.50
2023	0	0.12	1.63	1.75	1.52	1.51	1.35	1.58	1.51
2024	1.47	0.12	1.64	3.23	2.99	2.99	2.83	3.06	2.99
EIRR				**19%**	**17%**	**19%**	**16%**	**17%**	**15%**
Net Present Value discounted @ 12% ($)				**1.85**	**1.28**	**1.69**	**1.10**	**1.16**	**0.71**

Base EIRR	**19%**
Sensitivity Analysis - Key Variables	
Case 1 - 10 percent Increase in Capital Costs	**17%**
Case 2 - 10 percent Increase in O&M Costs	**19%**
Case 3 - 10 percent Decrease in Benefits	**16%**
Case 4 - 10 percent Increase in O&M Costs and 10 percent Decrease in Benefits	**17%**
Case 5 - Project Benefits delayed by One Year	**15%**

RITE Phase II Table 4
Economic Internal Rate of Return
Sub-project: Kasheke- Kitchanga

($)

Year	Incremental Cost		Incremental	Net Costs	Sensitivity Analysis				
	Capital	O&M	Benefits[1]	and Benefits	Case 1	Case 2	Case 3	Case 4	Case 5
2012	0.66			-0.66	-0.72	-0.66	-0.66	-0.66	-0.66
2013	0.99			-0.99	-1.09	-0.99	-0.99	-0.99	-0.99
2014	1.64			-1.64	-1.81	-1.64	-1.64	-1.64	-1.64
2015	0	0.01	0.77	0.76	0.76	0.76	0.69	0.69	-0.01
2016	0	0.01	0.78	0.77	0.77	0.77	0.69	0.69	0.76
2017	0	0.01	0.79	0.78	0.78	0.78	0.70	0.70	0.77
2018	0	0.01	0.79	0.79	0.79	0.79	0.71	0.71	0.78
2019	0	0.01	0.80	0.79	0.79	0.79	0.71	0.71	0.79
2020	0	0.01	0.81	0.80	0.80	0.80	0.72	0.72	0.79
2021	0	0.01	0.82	0.81	0.81	0.81	0.73	0.73	0.80
2022	0	0.01	0.83	0.82	0.82	0.82	0.74	0.74	0.81
2023	0	0.01	0.83	0.83	0.83	0.83	0.74	0.74	0.82
2024	0.66	0.01	0.84	1.51	0.11	0.18	0.09	1.42	0.17
EIRR				**18%**	**14%**	**16%**	**13%**	**15%**	**12%**
Net Present Value discounted @ 10% ($)				**1.20**	**0.54**	**0.82**	**0.45**	**0.83**	**0.26**

Base EIRR	**18%**
Sensitivity Analysis - Key Variables	
Case 1 - 10 percent Increase in Capital Costs	**14%**
Case 2 - 10 percent Increase in O&M Costs	**16%**
Case 3 - 10 percent Decrease in Benefits	**13%**
Case 4 - 10 percent Increase in O&M Costs and 10 percent Decrease in Benefits	**15%**
Case 5 - Project Benefits delayed by One Year	**12%**

All Routes

RITE Phase II Table 5
Economic Internal Rate of Return
Sub-project: All Prorgam Roads

($)

Year	Incremental Cost		Incremental	Net Costs	Sensitivity Analysis				
	Capital	O&M	Benefits	and Benefits	Case 1	Case 2	Case 3	Case 4	Case 5
				0.00					
2012	3.45			-3.45	-3.79	-3.45	-3.45	-3.45	-3.45
2013	5.53			-5.53	-6.09	-5.53	-5.53	-5.53	-5.53
2014	11.86			-11.86	-13.05	-11.86	-11.86	-11.86	-11.86
2015	0.00	0.42	3.83	3.41	3.41	3.37	3.03	2.99	-0.42
2016	0.00	0.42	5.91	5.49	5.49	5.45	4.90	4.86	3.41
2017	0.00	0.42	5.94	5.52	5.52	5.48	4.93	4.89	5.49
2018	0.00	0.42	5.97	5.55	5.55	5.51	4.95	4.91	5.52
2019	0.00	0.42	6.00	5.58	5.58	5.54	4.98	4.94	5.55
2020	0.00	0.42	6.03	5.61	5.61	5.57	5.01	4.97	5.58
2021	0.00	0.42	6.06	5.64	5.64	5.60	5.03	4.99	5.61
2022	0.00	0.42	6.09	5.67	5.67	5.63	5.06	5.02	5.64
2023	0.00	0.42	6.12	6.54	5.70	5.66	5.09	5.88	5.67
2024	3.41	0.42	6.15	9.98	9.10	9.10	8.53	9.32	9.11
EIRR				**19%**	**17%**	**18%**	**16%**	**16%**	**14%**
Net Present Value discounted @ 12% ($)				**6.35**	**4.34**	**5.77**	**3.66**	**3.90**	**2.24**

Base EIRR	**19%**
Sensitivity Analysis - Key Variables	
Case 1 - 10 percent Increase in Capital Costs	**17%**
Case 2 - 10 percent Increase in O&M Costs	**18%**
Case 3 - 10 percent Decrease in Benefits	**16%**
Case 4 - 10 percent Increase in O&M Costs and 10 percent Decrease in Benefits	**16%**
Case 5 - Project Benefits delayed by One Year	**14%**

A5 FURTHER RESEARCH INTO ECONOMIC IMPACTS OF POST CONFLICT TRANSPORT INVESTMENT PROGRAMS

A5.1 A Growing Need for Post Conflict Assistance

DFID and other key bilateral donors and MDB's are heavily involved in infrastructure provision in fragile and conflict –affected states world-wide. Some of these situations will require substantial post-conflict stabilisation packages, often involving considerable sums allocated for rehabilitation of infrastructure and communications. Post-Conflict Needs Assessments (PCNA's) are the multi-stakeholder initiatives that conceptualize, negotiate, and finance a shared strategy for recovery and development of war-to-peace transitions consistent with economic realities.

A5.2 Our Appreciation of how Best to Secure Development in Fragile States is still Modest…

In a speech to the International Institute for Strategic Studies, Geneva, the President of the World Bank[37] made the following statement on the issue of *Securing Development in Fragile States*:

1. The linkages and overlaps between weak governance, poverty and conflict help explain how states can remain fragile over decades; and
2. The most critical challenges are concentrated where governance, economy and security intersect.

To build the legitimacy of the state he recommended building institutional capacity *by doing things*: supplying clean water sanitation, (rehabilitating) simple roads to connect territories that may have been cut off from each other, etc. To provide security, he mentioned that the first among equally important services for a fragile situation is the establishment of a relatively safe and secure environment. Given the linkages between breakdowns in the economy and stability, *security and development need to go hand in hand*, mutually reinforcing each other.

A6.3 Nascent Research in Economic Programming for Post Conflict Situations

Economic programming should begin before the post conflict situation has stabilised.[38] Economic policy and programming should pursue a four–pronged strategy, namely:

- Reverse the immediate, negative impact of the conflict on the economy (humanitarian and reconstruction needs;
- Support peace-building to establish political stability and security, principally by helping to address the root cause of the conflict, especially those that are economic;
- Eliminate bottlenecks to restoring production and investment; and
- Lay the foundations for the resumption of long-term growth and development.

The four prongs must be implemented simultaneously, not sequentially. Nathan Associates noted that much of the literature on post conflict policy has been written by authors whose primary concerns are the political and security aspects of peace building. They noted the post-conflict challenges: without security the transaction costs of economic activities increase, particularly production and investment. The lack of security increases the costs of doing business and an enterprises' risk of failure, in turn precluding investor's willingness to invest. Productive activities simply cannot function efficiently in the absence of basic security. Nathan Associates concluded by stating: *'our review of the literature shows that our knowledge of appropriate economic interventions in post conflict settings is largely at the policy level rather than the programming level'*. They went on to recommend a systematic analysis of economic programming in post-conflict settings.

37 Fragile States: Securing Development, World Bank September 2008
38 Post Conflict Economic Policy and Programming: A Review of the Literature USAID Nathan Associates Inc. August 2006

Other researchers have recently commented on the issue of poor infrastructure: The *provision of infrastructure, and governments' willingness/ability to invest in infrastructure, is often a key factor in investors' perceptions of risk, which in turn affects the availability and pricing of commercial finance. This should make it a key priority. However, restoring infrastructure takes time, and can be a primary obstacle to growth. In considering sequencing, does the government have sufficient resources (financial and human capacity) to take a significant role in infrastructure investment? Or will shorter-term interim solutions be required?*39.

A5.4 A Lack of Research on the Economic Impacts (Benefits) of Road Infrastructure Investment Programs in Post-Conflict Situations….

The OECD 2011 argue basic growth in productive activities for example credit programs, *infrastructure*, and extension services are central to state building processes but have not figured prominently in donor policies.[40] Academic research also drew attention to this. The most evident economic opportunity post conflict is the high return to the reconstruction of infrastructure. Rural roads are critical to the re-integration of the rural economy to the urban market which is a fundamental aspect of post conflict recovery[41]. It was noted by IDC that post-conflict re-construction, including re-establishing basic infrastructure, forms a key part of stabilisation strategies.

In 2008, for instance, the Crisis States Research Centre recommended that *research should be conducted on the transportation infrastructure that must underpin any plan for economic reconstruction, in a context where many areas of the country are only accessible by air42.*

The reconstruction of roads has seen an important part of peacekeeping efforts, including the restoration of transport connections for re-integrating the rural subsistence economy into the market[43].

During Phase 1 of the EA it became apparent there is very little research illustrating the economic impacts of post-conflict road building programs on stabilisation (peace-keeping, local governance and in general the boosting if economic activity within affected regions).

There appear to be few, if any, guidelines[44] (or ongoing research) on the economic impacts of the road infrastructure programs designed to support stabilisation in fragile or conflict –affected states (e.g., where there is little present traffic and very low present economic activity).The EA notes that there is an important economic research gap in this area. A Desk Review Study is proposed below.

A5.5 Undertake a Desk Review Study of Economic Impacts of Transport Infrastructure Programs in Post Conflict Situations

In a first step, it appears sensible to carry out a broad Desk Review of **transportation sector** interventions in Post-Conflict situations. The review of the economic impacts of infrastructure development in fragile and post-conflict states could logically commence by:

- Investigating *Lessons Learned* from past and current post- conflict stabilisation strategies, through an examination of pertinent **transport infrastructure-related aspects** of the UNAMID, UNMASK, UNAMIR, UNAMSIL, MONUSCO and other UN peacekeeping operations.

USAID has financed the reconstruction of infrastructure in several post-conflict counties. For Afghanistan the program included road construction and repair in order to lower transportation costs. In Burundi, macroeconomic stabilization has been supported by the *Transport Infrastructure Rehabilitation Project*. The Review should also include pertinent USAID and World Bank funded post-

39 STRENGTHENING THE ECONOMIC DIMENSIONS OF PEACEBUILDING PRACTICE – Notes Series, Practice Note 5: Supporting the Economic Dimensions of Peace Processes, A. Wennmann.

40 Topic Guide on Fragile States Claire McLoughlin GSDRC DFID October 2010.

41 Post Conflict Recovery: How should Policies be distinctive? Paul Collier, Center for Study of African Economies, Department of Economics, Oxford University, May 2007

42 Working Paper No. 26 - Development as State-Making - DRIVERS OF CHANGE IN THE DEMOCRATIC REPUBLIC OF CONGO: THE RISE AND DECLINE OF THE STATE AND CHALLENGES FOR RECONSTRUCTION James Putzel, Stefan Lindemann and Claire Schouten Crisis States Research Centre January 2008

43 Collier, 2003 Breaking the Conflict Trap: Civil War and Development Policy

44 Funded by DFID or any other Bilaterals or MDB's

conflict infrastructure investments. It could also include a review of pertinent NGO funded transportation activities in post-conflict settings.

It is suggested that a Desk Review be limited to the transportation sector alone since, as noted by the DFID Minister, often the *first priority* is to establish '*any form of communication'* between population centres. It could investigate investments that have been made in all transport modes and impacts, before focussing thereafter, in more detail, on the road sub-sector.

(After the broad higher level transport sector review of investments (in all transport modes) is conducted, the Desk Review would then be in a better position to focus on an investigation of the economic impacts of road network improvements).

A Desk Review could investigate the impact of investments in *all* levels of the road network hierarchy (e.g. at the primary, secondary and tertiary levels) within each CAE. It is expected that improved regional connectivity might surface as a key success factor underpinning successful stabilisation and economic development efforts. Improved connectivity (and particularly connectivity within key economic corridors) is increasingly viewed by the MDB's as a major catalyst for economic growth.

There has often been a narrow focus on impacts at the lowest (tertiary) level of the network; on rural road access, for example. Such an overly narrow focus is likely to miss important and wider *connectivity* issues and opportunities, as identified by the MDB's. An overly narrow focus for the Desk Review might lead, for instance, to an underestimation of post-conflict program benefits from road rehabilitation.

A Desk Review should include reference to examples of *Best Practise*, including work done in DRC, Rwanda and Burundi. Specific examples of *Best Practice* in post-conflict road provision could be analyzed, to identify why some forms of interventions have succeeded, whilst other have failed. A subsequent *categorization of past post-conflict transport sector interventions* might include size and length of post-conflict program assistance, geographical and economic characteristics and a broad identification of key economic benefits, etc.

The Desk Review is expected to identify some key areas of future more focused research work within this area during 2012. Depending on the importance of the findings and wider interest, a ToR might be subsequently developed for wider ranging support to DFID/MONUSCO M&E staff.