DETAILED ECONOMIC ANALYSIS

1. The following economic analysis is presented in two parts. Part one assesses the economic investment into the five road subprojects representing output 1 within the DMF and Part Two assesses the tourism investment in output 2. The summary assesses the ability of the road and tourism subprojects to carry the overhead costs of capacity building, the project management and administration.

I. ECONOMIC ASSESSMENT OF ROADING SUBPROJECTS

A. Background

2. The objective of the Project is poverty reduction through economic growth. The project provinces rely on the agricultural sector for employment and income generation. Improvements in the transport linkages seek to increase the connectivity of the CLVDTA economies to regional and international markets. Given the high dependence of these economies on forestry and agricultural production the connectivity will provide increased efficiency in the market orientation of rural and agricultural production and provide better access to both services and markets for the rural poor.

3. While investment to date in national and provincial highways and on productive rural infrastructure has provided significant gains, the linkages between the two need to be strengthened. The investment proposed under the Project addresses these linkages. An early finding of the PPTA was that the investment required exceeded available resources and proposed that the focus of the Project be limited to infrastructure connecting into national highways, leaving future government and donor programs to support the local connections. The key arterials in the Project areas are National Highway 14 and 14c that pass through the five provinces in a north-south orientation that links into the Ho Chi Minh logistics node and export port and to the east west international border gates.

4. Viet Nam has an extensive road network and a relatively high overall road density. The present network comprises more than 256,000 km, but only about 17,000 km (7%) are classified as national highways, and only about 23,000 km (9%) are provincial roads. The vast majority of the network (84%) is local roads (classified as district, commune, or urban roads). This means that the network is not hierarchically well articulated.

5. Many of the provincial and district roads within the Vietnam Development triangle Area (VDTA) are in poor condition affecting farmers and small traders supplying processors and exporters further down the value chain. As NH 14 links the VDTA with Ho Chi Minh City in the south, it is critical that production areas are connected to NH14 for access to the ports and access to the main domestic market.

6. The project roads will contribute to the agricultural and rural economy by improving the connectivity of agricultural production areas to NH14 and thus to processing facilities and markets. The main benefit will be reduced transport costs. Since the reduction occurs at the first stage of the logistics chain, most of the benefits will accrue to the rural community. Secondary benefits will include a transfer from two wheel to four wheel transport for collection from the farms, further reducing transport costs; and an increase in the area under active cultivation/harvesting (particularly rubber plantations) as a result of greater farm-gate yields. No attempt has been made to quantify the secondary benefits. Reduced transport costs will also reduce the cost for fertilizer and other inputs and for travel by farm workers.

B. Road Subproject Description

7. Each Provincial EA has agreed one road subproject that was identified using multi-criteria analysis. The following briefly describes the project roads.

1. Kon Tum

8. The subproject in Kon Tum has the total length of 70.8 km. The road goes from North East to South West of the district through the area of Ia Toi and Ia Dal communes linking the province to NH14 in the east and NH14C and the Ho Da auxiliary border gate in the west. The subproject has two sections:

(i). Section 1 from junction with Road No.675 to junction with Road No.14C – total of 58.7km will be upgraded to Rural Road Type B in accordance TCVN 10380:2014 (road base: 5m; road surface: 3.5m; road side: 2x0.75m).

(ii). Section 2 from junction with Road No.14C to Ho Da Auxiliary Border Gate will be newly constructed in Grade V Mountain in accordance to TCVN4054-05 road base: 6.5m; road surface: 3.5m; road side: 2x1.0m).

9. The road will be built in cement concrete and will serve la H'Drai District whose population is predominantly ethnic minority and where the poverty rate is high. It will enable year-round access for rubber plantations and cassava cropping and is expected to lead to increased agricultural production generating additional employment.

2. Gia Lai

10. The Subproject upgrades 65.87km of provincial road No.665 to Vietnamese Standard Road Grade IV – Mountainous - with the surface width of 5.5 m and base width of 7.5 m. The road surface material is asphalt concrete with design speed of 40 km/h. The road provides a strategic east-west connection from NR 14 at Phu My Junction to NH 14C in the west and border post 729 (Gia Lai – Cambodia Border). The project road serves the districts of Chu Prong. Chu Prong is the biggest rubber producing district and second biggest coffee producer in Gia Lai. It is also high ranking in the production of the other export crops. The ethnic minority proportion, at 47% and the incidence of poverty at 12.4% are high, but not the highest in the province.

3. Dak Lak

11. The subproject in Dak Lak will upgrade NH-29. The subproject will upgrade 40km of National road No.29 to Vietnamese Standard Road Grade III – Mountainous (TCVN 4054-05) with the surface width of 7.5 m and base width of 9.0 m. The road surface material is asphalt concrete. The designation as NH29 for what is currently a minor provincial road reflects the Province's intention that this will form part of an eventual link from the Cambodian border at Dak Rue to the east coast port of Nha Trang. The section being improved under the project is of particular significance for Dak Lak province and primarily serves Cu M'Gar district, although it passes through the district of, Krong Buk and serves Ea Sup district indirectly. Cu M'Gar is the province's biggest coffee producer, it also is one of the larger producers of rubber, cashew and pepper. With Kong Buk it has one of the highest proportions of ethnic minorities and median level poverty within the province.

4. Dak Nong

12. The subproject in Dak Nong will upgrade the provincial road from NR No.14 to Bu Prang Border Gate (Section Km3-Km17 of PR No.686 and Section from Tuy Duc District Center to Dak Huyt Bridge) – Dak Nong Province. The Subproject will upgrade about 44 km to connect National Road No.14 (at Km817) to the end point at Bu Prang Border Gate, Tuy Duc district. The subproject will goes through the area of Nam N'Jang; Dak N'Drung communes – Dak Song district and Dak Buk So; Quang Truc communes in Tuy Duc district. Dak Song is the largest coffee and pepper producing district, while Tuy Duc and Dak Song have the second and third highest poverty rate respectively for the province.

5. Binh Phuoc

13. The Subproject in Binh Phuoc will upgrade 50.3 km of provincial road No.756 to Grade III – Mountain in accordance with TCVN 4054:2005. The road links the productive agricultural districts of Loc Ninh, Chon Thanh and Hon Quan with Hoa Lu and Hoang Dieu border crossings in the north and the main route to Ho Chi Minh City in the south. The start point is the Minh Lap junction with National Road No14 in Chon Thanh district. It goes through Minh Lap commune – Chon Thanh district; Tan Hung, Tan Loi, Thanh An communes – Hon Quan district; Loc Quang, Loc Phu, Loc Hiep communes – Loc Ninh district. The end point is the junction with provincial road No. 759B at the center of Loc Hiep commune at a distance of 22 and 31 km to Hoa Lu and Hoang Dieu international border gates respectively. The districts served by the road account for 47% and 53% of the province's rubber and pepper production respectively and 45% of the ethnic minorities.

C. Methodology

14. Since the main benefit from the project is through the reduction in transport costs, the economic analysis focused on estimation of the transport cost saving. This included savings for other (primarily rural) users of the sub-project roads. The economic analysis was carried out following ADB

"Guidelines for the Economic Analysis of Projects" comparing with and without–project scenarios using IRR and NPV at 12% discount rate as measures.

1. Selection of Options

15. Two road pavement options were selected for testing and were compared with a do minimum option that assumed general maintenance but no major work. Incremental analysis was used to compare the options. Under incremental analysis, a more expensive option is favored if comparing the incremental benefits to the incremental costs gives a return greater than the target 12%.

16. The options for all except Kon Tum were:

(i) Single asphalt concrete layer: for new work or where the existing pavement is completely replaced, the pavement would be formed using a single asphalt layer with two layers of crushed stone base course. Where the new pavement is on top of an existing pavement, the crushed stone layers are reduced depending on the calculated strength of the existing.

(ii) Double asphalt layer: As above, but with separate asphalt concrete base course and wearing course layers. The crushed stone layer is consequently reduced.

17. For the Kon Tum road, three options were tested being:

(i) surface dressing (3cm bituminous surface),

(ii) single layer asphalt concrete and

(iii) cement concrete.

2. Return for the Project

18. To calculate the overall return of the project, the selected treatment options were compared with a do minimum option. The economic analysis covers a period of 23 years (2017-2039), including 3 years for project implementation and 20 years of full usage of the reconstructed road. All benefits and costs are in constant 2016 prices using domestic prices but excluding VAT and other indirect taxes.

3. Engineering Assumptions

19. Without treatment the road roughness index (IRI) would gradually rise to 16 – the default maximum. Under the without project scenario it is assumed that the roads are repaired on an approximately 10 year cycle using penetration macadam or similar to give a 3cm bituminous surface. In practice financial constraints mean that roads are often not repaired until sections of the road pavement have completely failed.

20. Under the with-project scenario, the overlay or reconstruction reduces the IRI to 2.0 by 2018. It gradually rises under the assumed routine and periodic maintenance. Where, in some cases, it would exceed 8 before the end of the project period, a 'mid-life' overlay is included.

D. Traffic

1. Historical Data

21. The provinces do not have reliable data on traffic. All provinces have annual traffic count programs, but in all cases these have been suspended due to lack of funds. Traffic counts have been taken by the provinces from time to time, but not in any consistent manner. The data available is thus often dated and incomplete. There are count data for some provincial roads but only for some years and as such no consistent data series is available for analysis and projections. The existing data identifies that the bulk of the traffic by vehicle numbers is made up of two wheelers.

22. There is, in any case, a problem with annual counts. The agricultural nature of the activities along the project roads means that freight flows are heavily peaked around seasonal harvest times. Other flows including inbound fertilizer and the daily travels of farm workers are also seasonal. The same problem applies to the 'one-off' surveys conducted specifically for the project. Unless data are already available that would enable a seasonal adjustment to be made, a one-off count provides only limited input to annual traffic levels or composition. Additional surveys were nevertheless undertaken where there had

been no recent surveys. There were undertaken in July 2016, which is wet season with some roads impassable and no major harvesting being undertaken.

23. There has been a considerable growth in vehicle ownership over the last ten years, and this is expected to continue. This will be reflected in trip numbers on the project roads, although it is generally observed that the growth in traffic is less than the growth in ownership, suggesting declining marginal use as ownership increases. There is also evidence of a gradual move from two wheel to four wheel transport.

24. All the roads have sections that are in poor or very poor condition, and some traffic generation and diversion from other routes could be expected to occur. Improvement to the roads is expected to result in the earlier switch to larger vehicles in place of motorcycles. Thus the traffic will likely to be composed of fewer but larger vehicles. However because many link roads remain in a poor state, this will only affect part of the demand. .

a. Kon Tum

25. The proposed project road DT 675A is not yet fully passable. Counts have been taken during 2015 and 2016 but represent only local traffic at the north end of the subproject road. These are shown in Table 1.

Table 1: 2016 Counts - Kon Tum

Location (Chainage)	Cars / Jeeps / Taxis	Small bus	Intercity Bus	Light truck/ van	Large Truck 2 axle, 6 wheels	Large Truck 3 axle	Large Truck 4 axle	Motor cycle	Time of counting
Km80+000	**16**	**3**	**-**	**20**	**17**	**3**	**-**	**166**	
	22	4	0	19	15	3	0	165	January
	17	4	0	29	16	4	0	186	February
	17	2	0	15	21	2	0	151	March
	10	2	0	23	13	1	0	179	April
	12	2	0	16	18	5	0	150	May
Km23+100	**14**	**3**	**-**	**18**	**15**	**3**	**-**	**136**	
	14	4	0	20	14	4	0	115	January
	19	4	0	15	18	4	0	133	February
	12	2	0	16	10	2	0	117	March
	11	2	0	19	18	5	0	142	April
	16	2	0	21	13	1	0	175	May
Average	**15**	**3**	**0**	**19**	**16**	**3**	**0**	**151**	

Source: Kon Tum DoT

26. Rather than use the figures in Table 1, a comparison was made with an existing road serving the province. Detailed counts are available for DT 675. These are shown in Table 2: Motorcycles and bicycles were not counted.

Table 2: Traffic Count Kon Tum (DT 675)

Year	Cars	Small-Med Buses	Large Buses	Light-Med trucks	Heavy trucks (3 axles)	Heavy (>3 axles)	Tractor	Total (vehicles)
2013	160	12	5	567	128	57	94	1,023
2014	188	16	5	709	148	70	74	1,102

Source: Kon Tum DoT

b. Gia Lai

27. There is one historical count available for Gia Lai that included the project road taken in 2010 and another in 2014. These are shown as Table 3: These were supplemented with a special count in July 2016.

Table 3: Traffic Counts Gia Lai (DT 665)

Year	Cars	Small-Med Buses	Large Buses	Light-Med trucks	Heavy trucks (3 axles)	Heavy (>3 axles	MC	Bike	Tractor	Total vehicle
2010	21	7	2	54	20	0	1,061	29	29	1,223
2014	64	34	13	184	188	179	376	na	na	660
2016	102	16	2	8	10	5	3460	na	16	3618

Source: Gia Lai DoT

c. Dak Lak

28. In Dak Lak, the only historical counts are for 2010. The project road, NH29 is made up of former provincial roads DT691 and DT696. Neither of these have count data. DT 692 was identified as the closest corresponding road. The counts for DT 692 are shown in Table 4: A special count undertaken in July 2016 is also shown.

Table 4: Traffic Count Dak Lak

Provincial Road No.	Cars	Small-Med Buses	Large Buses	Light-Med trucks	Heavy trucks (3 axles)	Heavy (>3 axles	MC	Bike	Tractor	Total vehicle
DT692 (2010)	31	16	4	26	106	30	3,219	1239	132	**4,803**
PH 29 (2016)	180	24	36	86	35	26	6,002	na	156	**6,546**

Source: Dak Lak DoT

d. Dak Nong

29. There are data for Dak Nong for 2012. The project road includes a small part of DT686 close to the Cambodian border. Dak Nong also publishes traffic data for 2015, 2020 and 2030. The figure for 2015 is included in Table 6: , but it would appear that this was an estimate not an actual count. The July 2016 count, which is the average of counts at three locations on the project road, is also shown.

Table 5: Traffic Counts Dak Nong DT 686

Year	Cars	Small-Med Buses	Large Buses	Light truck	Medium truck	Heavy trucks (3 axles & more)	Heavy (>3 axles)	MC	Total vehicle
2012	141	123	25	151	133	153	18	396	744
2015	263	880	721	143	519	127	152	263	880
2016	142	20	16	86	59	24		794	1212

Source: Dak Nong DoT

e. Binh Phuoc

30. Binh Phuoc has traffic counts for six its provincial roads including. DT 756 in 2014. It also has specific counts for PR 756 taken in 2015 and 2016 as shown in Table 6: .

Table 6: Traffic Counts Binh Phuoc 2014

Year	Cars	Small-Med Buses	Large Buses	Light-Med trucks	Heavy trucks (< 3 axles)	Heavy trucks (>3 axles)	MC	Bike	Vehicles
2014	25	19	2	43		6	674	313	1,212
2015	106	12	10	133	9	2	650	145	1,405
2016	118	16	15	95	13	5	665	117	1,398

Source: Binh Phuoc DoT

31. The lower count in 2016 is believed to be partly because of the deteriorating condition of the road, but may also simply reflect the daily and seasonal variation in traffic levels.

2. Moving Vehicle Surveys

32. Estimated traffic counts were obtained as part of the initial screening. This included moving vehicle surveys undertaken by the Consultants as part of their field surveys and initial data provided by the PPMU. The results are shown in Table 7: The Consultant counts in this table did not include motorcycles or tractors. The counts are generally lower than what might be expected from the historical data. 'One-off' counts could be expected to show significant day to day and seasonal variability.

Table 7: Traffic Count Estimates for Initial Screening

Province	Name of Road	Count	Remark
Kon Tum	PR673A	177	Based on data from PPMU (road under construction)
Gia Lai	PR 665	111	Based on data from PPMU
Dak Lak	NR 29	229	Based on data from PPMU
Dak Nong	PR 686	278	Based on traffic count during site visit
Binh Phuoc	PR 756	627	Based on 2013 data from PPMU

Source: As indicated

3. Traffic Growth

33. There are insufficient data on actual traffic to use for estimating traffic growth on the project roads. Traffic growth was therefore estimated from historical data relating to

- Growth in transport activity
- Vehicle ownership
- Growth in agricultural output
- Growth in GDP

34. These measures were also used to bring the historical counts for the project roads to a common base year figure for 2016.

a. Transport Activity

35. Statistics for the five years 2010-2014 are available in the provincial year books for i) passengers carried, ii) passenger-km, iii) tons carried and iv) ton-km. While these are province-wide figures, they provide some idea of the rate of development. Table 8: shows the percentage growth over the five years estimated by fitting a logarithmic growth curve.

Table 8: Percentage Growth in Transport Activities 2010 - 2014

	Kon Tum	Gia Lai	Dak Lak	Dak Nong	Binh Phuoc	Average
passengers (000)	25%	21%	10%	7%	7%	14%
passenger-km (m)	25%	21%	10%	9%	9%	15%
Tons freight (000)	16%	21%	10%	8%	8%	12%
Ton-km freight (m)	14%	19%	11%	16%	10%	14%
% own car in 2014	0.9%	2.6%	2.5%	1.3%	1.8%	2%
growth from 2010	4%	32%	16%	22%	10%	17%
% own m/c in 2014	80%	88%	91%	91%	93%	90%
growth from 2010	4%	4%	2%	4%	0.2%	3%

Source: Provincial year books

36. Transport activity grew strongly in all provinces, but more so in the northern two provinces. Planting of rubber in Kon Tum and Gia Lai provinces means that forest areas were harvested and this may be contributing to the high tonnage growth rates. This might affect both freight and passengers, with labour being required to work on the rubber planting.

37. The other three provinces have much more mature agricultural sector land uses and there was little new development and hence limited increases in output.

38. The year books also record the percentage of households owning cars and owning motorbikes. Around 90% of households own a motorbike (or motor scooter) as against only two percent owning a car. However car ownership is increasing rapidly in most provinces.

39. Vehicle registration data is available at the provincial level. However it shows a high growth in ownership that is likely to be greater than the growth of traffic on the roads as the increase in vehicle ownership tends to be greater in the cities.

b. Agricultural Production

40. Growth in agricultural production is relevant to the demand for transport. Increasing production will generally mean an increase in both person transport for planting, tending and harvesting the crops, and freight transport for inputs of fertilizer and output of produce.

41. Table 9: shows significant growth in agricultural production, but generally less than the growth of total GDP (Table 10: below). This is consistent with SEDP forecasts of a declining agriculture share.

Table 9: GDP generated by agriculture and fisheries (Billion Dong)

Provinces	2010	2011	2012	2013	2014	Average growth
Kon Tum	2486	2715	2904	3102	3313	7.3%
Gia Lai	8434	9130	9656	10292	10989	6.7%
Dak Lak	14480	15535	15383	15873	16379	1.9%
Dak Nong	4346	4746	5259	5751	6235	9.6%
Binh Phuoc	8778	9282	9914	10510	11316	6.5%

Source: Provincial year books

c. Gross Domestic Product

42. Table 10: compares the gross domestic product (GDP) across the provinces.

Table 10: Provincial Gross Domestic Product (Billion Dong)

	2010	2011	2012	2013	2014	Average growth
Kon Tum	6028	6873	7816	8785	9997	13.4%
Gia Lai	24000	26309	27568	29342	31633	6.8%
Dak Lak	32344	33975	34891	36652	38889	4.6%
Dak Nong	8107	9149	10272	11554	12964	12.4%
Binh Phuoc	20229	22901	25774	28235	30103	10.6%

Source: Provincial Year books

43. Binh Phuoc has a much higher per capita GDP and has a much more diversified economy. It is normally possible to relate growth in transport demand to growth in GDP by applying an elasticity whereby the change in demand is proportional to the change in GDP to the power of the elasticity. Looking at the individual provinces, and comparing the growth in freight and passenger traffic with the growth in GDP gives the elasticities shown in Table 11: [1].

Table 11: Elasticities for Passengers and Freight

Province	Passenger	Freight
Kon Tum	1.62	0.99
Gia Lai	1.67	2.47
Dak Lak	1.79	1.89
Dak Nong	0.72	1.18
Binh Phuoc	0.84	0.91
Total	1.46	1.56

Source: consultant estimate

[1] This is the most-simple form of the underlying relationship. Some authors make the distinction between gdp and gdp per head for passenger numbers. In this case the data does not seem sufficiently robust to worry about refining the relationship.

44. Typically the GDP elasticity should be somewhere between 0.9 (for mature economies) and 1.2. The derived values are somewhat more variable than this possibly suggesting measurement problems in one or both of the measures. The analysis was undertaken using an elasticity of 1.2. A low forecast using an elasticity of 0.9 was also tested,

45. While historical growth rates have been high – 15 to 20 percent – future growth is assumed to be more in line with recent population and GDP growth (2.0 and 3.6 percent respectively) as shown in Table 12:

Table 12: Traffic growth estimates

Provinces	Low forecast		High forecast	
	Before 2020	After 2020	Before 2020	After 2020
Kon Tum	12%	6%	18%	9%
Gia Lai	10%	5%	15%	7%
Dak Lak	9%	4%	14%	7%
Dak Nong	12%	6%	16%	8%
Binh Phuoc	10%	5%	16%	8%

Source: Consultant estimates

4. Consultant Baseline Estimate

46. Baseline traffic estimates were developed by applying the traffic growth estimates to the latest data available for each of the provinces and were compared with the 2016 counts. For Kon Tum, because the current road is still being constructed, an estimate was developed using the counts for PR 675 and adjusting for the estimated population served. The 'without' case assumes that the road in Kon Tum will be completed but to a lower standard, possibly without year-round connectivity.

47. The 2016 count was 80% and 30% higher than the estimate For Gia Lai and Dak Lak respectively, although the number of heavy vehicles was substantially less possibly reflecting the fact that this was not harvest time. The 2016 count for Dak Nong was only 60% of the estimate, probably due to the project only incorporating part of the road for which historical counts were available. In the case of Binh Phuoc, when compared with the result of applying the GDP growth factors to the 2014 count, the 2016 figures are higher and have a larger percentage of cars rather than motorcycles.

48. In the event the 2016 count has been taken. The Consultant's estimate of the current traffic is shown in Table 13:

Table 13: Baseline demand, 2014

Section	Province	Motorcycles	Cars	Buses	Trucks	Total PCU
PR 675A	Kon Tum	192	32	4	157	207
PR 665	Gia Lai	3461	102	18	23	3619
NR 29	Dak Lak	6002	180	60	148	6546
PR686	Dak Nong	794	142	36	169	1212
PR 756	Binh Phuoc	658	112	24	129	1053

Source: Consultant estimates

5. Future Traffic Estimates

49. The economic analysis was undertaken using a growth scenario based on forecast GDP growth. As well as traffic growth due to general economic growth, the Project roads will attract generated

traffic. The amount of generation assumed varied by road as follows: Kon Tum 20%, Gia Lai 30%, Dak Lak 10%, Dak Nong 20% and Binh Phuoc 30%.

50. The with and without forecasts are shown in Table 14: and Table 15: 5

Table 14: Forecast AADT, 2018–2037 without project scenario

Section	Province	2016	2020	2025	2030	2035	2039
PR 675A	Kon Tum	397	624	835	1,117	1,495	1,888
PR 665	Gia Lai	3,619	5,298	6,762	8,630	11,014	13,387
NR 29	Dak Lak	6,546	9,241	11,243	13,678	16,642	19,469
PR686	Dak Nong	1,212	1,907	4,363	9,981	22,835	44,272
PR 756	Binh Phuoc	1,053	1,541	1,967	2,510	3,204	3,894

AADT = Annual Average Daily Traffic

Source: Consultant estimates.

Table 15: Forecast AADT, 2018–2037 with project scenario

Section	Province	2016	2020	2025	2030	2035	2039
PR 675A	Kon Tum	397	749	1,002	1,341	1,794	2,265
PR 665	Gia Lai	3,619	6,887	8,790	11,219	14,318	17,404
NR 29	Dak Lak	6,546	10,165	12,367	15,046	18,306	21,416
PR686	Dak Nong	1,212	2,289	5,236	11,978	27,402	53,127
PR 756	Binh Phuoc	1,053	2,003	2,557	3,263	4,165	5,062

AADT = Annual Average Daily Traffic

Source: Consultant estimates.

E. Costs and Benefits

1. Economic Costs

51. Project economic costs include the cost of resources for road improvement and maintenance, equipment and consulting services. Financial costs were converted to economic costs following the method described in Appendix 10 of the ADB Guidelines for Undertaking Economic Analysis, taking into account vat and sales taxes, the proportion of foreign costs, land costs, design / supervision costs, contingencies, profit, cost of components etc. A standard conversion factor (SCF) is used to convert domestic market prices (less taxes) of non-tradable goods to economic prices.

52. The SCF is calculated using the simple trade weighted formula presented in ERD Technical Note no 11, Feb 2004.

SCF = (exports fob + imports cif) ÷ (imports cif + import duties + exports fob - export taxes)

53. The calculation is set out in Table 16: This gives an SCF of 98%.

Table 16: Standard conversion factor

Item	2014
Exports fob, US $b	132,033
Imports cif, US $b	132,033
Duties and rebates US $b	5,824
SCF	98%

54. Adopting an SCF of 0.98 means that financial market prices of non-tradable goods are converted to an international numeraire expressed in US$ by first multiplying their domestic prices (less taxes, but not duties) by 0.98 and then using the official exchange rate(US$1 = VND 22300) to convert to US$. As a domestic numeraire has been adopted, costs of imported items (estimated to be 40% of the imported price) been multiplied by the reciprocal of the SCF (the shadow exchange rate). Applying the SCF to the tax excluded financial costs gives economic costs for the options tested shown in Table 17: .

Table 17: Economic Costs for Project Options

Provinces	Road	Length km	Option1	Option2
Kon Tum	PR 675A	58.8	13,885	18,141
Gia Lai	PR 665	65.9	15,894	22,468
Dak Lak	NR 29	40	16,459	19,774
Dak Nong	PR686	39	15,959	16,929
Binh Phuoc	PR 756	50.3	15,617	19,703
Total			77,815	97,015

Source: Consultant estimates

2. Road Agency Benefits

55. Road agency benefits comprise reduced routine and periodic maintenance in the 'without project' case. In practice it is hard to be sure what the response would be in the event that the Project does not proceed. The provinces do have maintenance strategies that should keep the roads in good condition, but the strategies are not followed because of lack of money. Some roads or road sections will receive regular maintenance under the provinces' annual program while other sections may be left to deteriorate further. For the analysis it has been assumed that the without case will require periodic low-cost resurfacing (or equivalent) at a cost of $125,000 per kilometer at year 2020, 2030 and 2039. Routine maintenance is undertaken on a planned rather than a needs basis and apart from the first five years after construction is assumed to be $2000/km in both with and without cases. In the with project case this is assumed to reduce to $1,000/km for the first five years.

3. User Benefits

56. The principal sources of economic benefits from the Project are savings in vehicle operating costs (VOCs), and time savings. The roads improve the interconnection between agricultural production areas, district centers and export and domestic markets. Savings in VOCs comprise the largest category of benefits, accounting for up to 80 percent of total benefits, and arise from the improved road conditions resulting from the civil works carried out under the Project. In the 'with project' case, the international roughness index (IRI) is assumed to be 2.0 after the road is reconstructed and to rise gradually to 8 over a period of 10 years at which point a mid-life overlay would be applied. In the without case, the low-cost treatment is assumed to bring the IRI down to 4.0. The rate of deterioration is assumed to be faster, with the IRI rising to 16 before the road is re-surfaced.

57. VOC are dependent on the IRI and are calculated for each vehicle type. Unit economic VOCs for passenger and freight vehicles were estimated as a function of the IRI using a table derived from the Highway Design and Maintenance Model HDM4. VOC savings will accrue primarily from improvements to the road surface. Table 18: shows the VOC for representative IRI.

58. The reconstruction of the road results in time savings due to the improved road conditions. The value of travel time savings used varies with the vehicle type and travel purpose. USD 0.90 per hour for business travel by bus or motorcycle and USD 2.0 per hour for business travel by car (per passenger in each case). Following usual practice, the values for non-business travel is taken to be 25% of those for business travel. Savings in freight driver wages and vehicle ownership costs are included in the VOC.

Table 18: Vehicle Operating Costs as a Function of IRI (US cents per kilometre)

IRI	Cars	Small-Med Buses	Large Buses	Light-Med trucks	Heavy trucks (3 axles)	Heavy (>3 axles	M/C	Tractor
2	23.1	31.4	57.7	34.0	52.2	57.5	4.0	9.6
5	25.2	35.7	66.0	37.4	58.4	62.9	4.2	10.9
8	27.5	40.6	75.5	41.1	65.3	68.8	4.5	12.3
12	30.9	48.2	90.4	46.6	75.7	77.6	4.9	14.5
16	34.8	57.2	108.1	52.8	87.8	87.6	5.4	17.0

Source: HDM-4 analysis

F. Greenhouse Gases

59. ADB and the Government of Vietnam are concerned about the effect of projects on the generation of greenhouse gases. Vehicle emissions can be calculated in HDM-4 based on estimated fuel use. Fuel use is dependent on both the quantum of travel and vehicle speeds. CO_2 emissions from vehicles with the project are estimated to be higher with the project than without. The increase is primarily due to generated traffic but also the effect of higher fuel consumption at higher speeds. However much of the new traffic will in fact be diverted from other, longer routes. There will also be some differences due to a move from two wheel to four wheel transport, with the former being more fuel efficient and thus producing less emissions for passenger travel but the latter being more efficient for freight.

G. Results of Economic Analysis

60. The economic analysis was undertaken for each of the five road subprojects, in each case comparing the two treatment options (three for Kon Tum) with the do minimum. The preferred treatment if funding is not a constraint is the treatment providing the highest NPV at 12%.

61. A preliminary analysis was undertaken for Kon Tum comparing thin asphalt treatment with single layer asphalt concrete which showed that both were economically viable and that asphalt concrete was marginally preferable. Table 19: therefore compares the asphaltic concrete option (option 1) with cement concrete (option 2). Cement concrete was considered as an option because of its greater resilience given the steep gradients and high rainfall. However it is significantly more expensive. All other cases compare single with double treatment. The results are summarized in Table 19:. Detailed cost and benefits by year are shown in Table 20 to Table 24, while an overall cost and benefit flow is shown as in Table 25.

Table 19: Results by Road and Option

Provinces	Roads	Option 1		Option 2		Increment	
		NPV $M	EIRR	NPV $M	EIRR	NPV $M	EIRR
Kon Tum	PR 675A	1,751	14.2%	369	12.3%	-1,383	6.1%
Gia Lai	PR 665	6,830	18.7%	2,767	14.0%	-4,064	-1.0%
Dak Lak	NR 29	5,182	16.4%	3,997	14.9%	-1,185	5.5%
Dak Nong	PR686	1,009	12.9%	1,037	12.9%	28	12.5%
Binh Phuoc	PR 756	1,126	13.1%	-1,237	11.0%	-2,362	0.3%

Source: consultant analysis

62. The EIRR for output 1 is 14.5% with a net present value of $13.2 million. The detailed benefit and cash flows are shown in the following tables.

Table 20: Kon Tum Costs and Benefits

Year	Capital Works		Maintenance		User VOC		User time		Generated traffic		Net
	With	Without	With	Without	With	Without	With	Without	VOC	Time	Benefit
2017	6,047	0	59	118	2,578	2,578	84	84	0	0	-5,988
2018	6,047	0	59	118	3,178	3,178	106	106	0	0	-5,988
2019	6,047	0	59	118	3,918	3,918	135	135	0	0	-5,988
2020	0	7,350	59	118	3,224	4,726	87	165	150	8	9,146
2021	0	0	59	118	3,539	3,711	96	104	17	1	257
2022	0	0	59	118	3,885	4,226	106	122	34	2	452
2023	0	0	59	118	4,264	4,812	117	143	55	3	690
2024	0	0	118	118	4,681	5,480	129	168	80	4	921
2025	0	0	118	118	5,138	6,240	142	197	110	5	1,271
2026	0	0	118	118	5,640	7,105	157	230	146	7	1,692
2027	0	0	118	118	6,191	8,090	173	270	190	10	2,196
2028	0	0	118	118	6,796	9,212	191	317	242	13	2,796
2029	0	0	118	118	7,460	10,263	211	358	280	15	3,245
2030	0	7,350	118	118	8,189	11,187	232	390	300	16	10,821
2031	0	0	118	118	8,990	8,786	256	247	-20	-1	-234
2032	0	0	118	118	9,868	10,005	282	289	14	1	157
2033	0	0	118	118	10,832	11,392	312	339	56	3	646
2034	0	0	118	118	11,891	12,972	344	397	108	5	1,249
2035	0	0	118	118	13,052	14,771	379	465	172	9	1,986
2036	0	0	118	118	14,328	16,820	418	546	249	13	2,882
2037	0	0	118	118	15,728	19,153	461	639	343	18	3,964
2038	0	0	118	118	17,265	21,809	508	750	454	24	5,265
2039	0	7,350	118	118	18,951	24,297	561	847	535	29	13,546
2040											
											369
											12.3%

Table 21: Gia Lai Costs and Benefits

Year	Capital Works		Maintenance		User VOC		User time		Generated traffic		Net
	With	Without	With	Without	With	Without	With	Without	VOC	Time	Benefit
2017	5,298	0	66	132	5,763	5,763	790	790	0	0	-5,232
2018	5,298	0	66	132	6,867	6,867	978	978	0	0	-5,232
2019	5,298	0	66	132	8,184	8,184	1,210	1,210	0	0	-5,232
2020	0	8,238	66	132	7,500	9,753	871	1,497	338	94	11,614
2021	0	0	66	132	8,169	8,390	967	1,022	33	8	383
2022	0	0	66	132	8,898	9,303	1,074	1,177	61	15	650
2023	0	0	66	132	9,692	10,315	1,192	1,355	93	24	970
2024	0	0	132	132	10,556	11,437	1,323	1,560	132	36	1,286
2025	0	0	132	132	11,498	12,681	1,468	1,797	177	49	1,738
2026	0	0	132	132	12,524	14,061	1,630	2,069	231	66	2,272
2027	0	0	132	132	13,642	15,591	1,809	2,382	292	86	2,900
2028	0	0	132	132	14,859	17,287	2,008	2,743	364	110	3,637
2029	0	0	132	132	16,185	18,830	2,229	3,044	397	122	3,980
2030	3,179	8,238	132	132	17,629	20,148	2,474	3,258	378	118	8,857
2031	0	0	132	132	15,786	16,504	1,834	2,011	108	26	1,029
2032	0	0	132	132	17,194	18,300	2,036	2,315	166	42	1,592
2033	0	0	132	132	18,728	20,291	2,260	2,666	234	61	2,263
2034	0	0	132	132	20,399	22,499	2,509	3,069	315	84	3,059
2035	0	0	132	132	22,220	24,946	2,784	3,534	409	112	3,998
2036	0	0	132	132	24,202	27,660	3,091	4,069	519	147	5,103
2037	0	0	132	132	26,362	30,670	3,431	4,686	646	188	6,398
2038	0	0	132	132	28,714	34,006	3,808	5,395	794	238	7,912
2039	0	8,238	132	132	31,276	37,041	4,227	5,989	865	264	16,894
2040											
							0	0	0	0	6,830
											18.7%

Table 22: Dak Lak Costs and benefits

Year	Capital Works		Maintenance		User VOC		User time		Generated traffic		Net
	With	Without	With	Without	With	Without	With	Without	VOC	Time	Benefit
2017	5,486	0	40	80	7,298	7,298	963	963	0	0	-5,446
2018	5,486	0	40	80	8,630	8,630	1,181	1,181	0	0	-5,446
2019	5,486	0	40	80	10,206	10,206	1,448	1,448	0	0	-5,446
2020	0	5,000	40	80	9,424	12,069	1,085	1,776	132	35	8,542
2021	0	0	40	80	10,271	10,557	1,204	1,272	14	3	412
2022	0	0	40	80	11,193	11,717	1,336	1,464	26	6	725
2023	0	0	40	80	12,198	13,005	1,483	1,685	40	10	1,100
2024	0	0	80	80	13,293	14,435	1,645	1,939	57	15	1,508
2025	0	0	80	80	14,486	16,022	1,826	2,232	77	20	2,039
2026	0	0	80	80	15,787	17,783	2,027	2,570	100	27	2,666
2027	0	0	80	80	17,204	19,738	2,249	2,958	127	35	3,405
2028	0	0	80	80	18,749	21,908	2,496	3,405	158	45	4,271
2029	0	0	80	80	20,432	23,875	2,770	3,779	172	50	4,674
2030	3,292	5,000	80	80	22,267	25,546	3,074	4,043	164	48	6,169
2031	0	0	80	80	19,837	20,767	2,283	2,501	46	11	1,205
2032	0	0	80	80	21,618	23,050	2,534	2,879	72	17	1,866
2033	0	0	80	80	23,559	25,584	2,812	3,314	101	25	2,653
2034	0	0	80	80	25,674	28,396	3,121	3,815	136	35	3,587
2035	0	0	80	80	27,979	31,518	3,463	4,391	177	46	4,690
2036	0	0	80	80	30,492	34,982	3,844	5,055	225	61	5,987
2037	0	0	80	80	33,229	38,828	4,266	5,819	280	78	7,509
2038	0	0	80	80	36,213	43,097	4,734	6,698	344	98	9,290
2039	0	5,000	80	80	39,464	46,966	5,254	7,433	375	109	15,165
2040											
							0	0	0	0	5,182
											16.4%

Table 23: Dak Nong Costs and Benefits

Year	Capital Works		Maintenance		User VOC		User time		Generated traffic		Net
	With	Without	With	Without	With	Without	With	Without	VOC	Time	Benefit
2017	5,643	0	39	78	3,286	3,286	295	295	0	0	-5,604
2018	5,643	0	39	78	4,042	4,042	375	375	0	0	-5,604
2019	5,643	0	39	78	4,973	4,973	475	475	0	0	-5,604
2020	0	4,875	39	78	4,384	6,118	338	603	173	27	7,113
2021	0	0	39	78	4,841	5,034	377	403	19	3	280
2022	0	0	39	78	5,346	5,720	420	473	37	5	509
2023	0	0	39	78	5,903	6,500	468	554	60	9	790
2024	0	0	78	78	6,519	7,386	522	649	87	13	1,094
2025	0	0	78	78	7,198	8,394	582	761	120	18	1,511
2026	0	0	78	78	7,949	9,538	649	891	159	24	2,014
2027	0	0	78	78	8,778	10,839	724	1,044	206	32	2,620
2028	0	0	78	78	9,693	12,317	807	1,224	262	42	3,345
2029	0	0	78	78	10,704	13,708	900	1,383	300	48	3,836
2030	0	4,875	78	78	11,821	14,942	1,003	1,508	312	50	8,863
2031	0	0	78	78	13,053	11,916	1,119	955	-114	-16	-1,431
2032	0	0	78	78	14,415	13,541	1,247	1,119	-87	-13	-1,102
2033	0	0	78	78	15,918	15,388	1,391	1,311	-53	-8	-670
2034	0	0	78	78	17,578	17,486	1,550	1,536	-9	-1	-116
2035	3,386	0	78	78	19,411	19,871	1,729	1,800	46	7	-2,800
2036	0	0	78	78	17,404	22,581	1,342	2,110	518	77	6,539
2037	0	0	78	78	19,219	25,660	1,496	2,472	644	98	8,159
2038	0	0	78	78	21,224	29,159	1,668	2,897	794	123	10,081
2039	0	4,875	78	78	23,437	32,452	1,860	3,275	902	141	16,348
2040											
							0	0	0	0	368
											12.3%

Table 24: Binh Phuoc Costs and Benefits

Year	Capital Works		Maintenance		User VOC		User time		Generated traffic		Net
	With	Without	With	Without	With	Without	With	Without	VOC	Time	Benefit
2017	5,206	0	50	101	3,146	3,146	264	264	0	0	-5,155
2018	5,206	0	50	101	3,809	3,809	329	329	0	0	-5,155
2019	5,206	0	50	101	4,613	4,613	410	410	0	0	-5,155
2020	0	6,288	50	101	4,292	5,586	330	511	194	27	8,034
2021	0	0	50	101	4,736	4,892	370	390	23	3	252
2022	0	0	50	101	5,227	5,515	414	452	43	6	427
2023	0	0	50	101	5,767	6,218	463	524	68	9	640
2024	0	0	101	101	6,364	7,011	518	608	97	14	848
2025	0	0	101	101	7,023	7,905	580	705	132	19	1,159
2026	0	0	101	101	7,750	8,913	649	818	174	25	1,532
2027	0	0	101	101	8,552	10,049	726	949	225	33	1,978
2028	0	0	101	101	9,437	11,330	813	1,100	284	43	2,508
2029	0	0	101	101	10,413	12,503	910	1,231	313	48	2,773
2030	3,123	6,288	101	101	11,491	13,503	1,018	1,330	302	47	5,837
2031	0	0	101	101	10,008	10,561	770	842	83	11	718
2032	0	0	101	101	11,043	11,907	862	976	130	17	1,125
2033	0	0	101	101	12,186	13,425	964	1,132	186	25	1,617
2034	0	0	101	101	13,447	15,137	1,079	1,313	253	35	2,211
2035	0	0	101	101	14,839	17,066	1,208	1,523	334	47	2,923
2036	0	0	101	101	16,375	19,242	1,352	1,766	430	62	3,774
2037	0	0	101	101	18,069	21,695	1,513	2,048	544	80	4,785
2038	0	0	101	101	19,939	24,461	1,693	2,375	678	102	5,984
2039	0	6,288	101	101	22,003	26,993	1,895	2,658	748	114	12,903
2040											
							0	0	0	0	1,126
											13.1%

Table 25: Overall Cost and Benefit Flows

Year	Capital Works		Maintenance		User VOC		User time		Generated traffic		Net Benefit
	With	Without	With	Without	With	Without	With	Without	VOC	Time	
2017	27,680	0	254	508	22,071	22,071	2,396	2,396	0	0	-27,426
2018	27,680	0	254	508	26,528	26,528	2,968	2,968	0	0	-27,426
2019	27,680	0	254	508	31,894	31,894	3,678	3,678	0	0	-27,426
2020	0	31,750	254	508	28,824	38,251	2,712	4,552	988	190	44,449
2021	0	0	254	508	31,555	32,583	3,014	3,191	107	18	1,584
2022	0	0	254	508	34,547	36,481	3,350	3,687	202	34	2,762
2023	0	0	254	508	37,824	40,851	3,723	4,261	316	55	4,190
2024	0	0	508	508	41,413	45,749	4,138	4,925	453	80	5,657
2025	0	0	508	508	45,344	51,242	4,599	5,691	616	112	7,718
2026	0	0	508	508	49,650	57,401	5,112	6,578	810	150	10,177
2027	0	0	508	508	54,367	64,308	5,681	7,603	1,040	196	13,098
2028	0	0	508	508	59,534	72,055	6,315	8,788	1,310	253	16,557
2029	0	0	508	508	65,195	79,179	7,019	9,795	1,463	284	18,508
2030	9,594	31,750	508	508	71,396	85,326	7,802	10,528	1,456	279	40,547
2031	0	0	508	508	67,674	68,534	6,262	6,555	103	31	1,287
2032	0	0	508	508	74,138	76,803	6,961	7,578	293	64	3,639
2033	0	0	508	508	81,224	86,080	7,739	8,762	524	106	6,510
2034	0	0	508	508	88,989	96,490	8,603	10,131	803	158	9,990
2035	3,386	0	508	508	97,501	108,173	9,563	11,714	1,138	222	10,796
2036	0	0	508	508	102,801	121,286	10,046	13,546	1,940	359	24,284
2037	0	0	508	508	112,607	136,006	11,166	15,664	2,457	462	30,815
2038	0	0	508	508	123,354	152,533	12,412	18,115	3,064	586	38,532
2039	0	31,750	508	508	135,131	167,749	13,796	20,202	3,424	658	74,856
											13,874
											14.6%

63. All the sub-projects have EIRR exceeding 12%. In the case of Kon Tum and Dak Nong, Option 2 has a higher NPV than Option 1, hence for these roads, the higher cost treatment is preferred.

1. Distribution Analysis

64. No formal distribution analysis has been attempted as it is difficult to predict where in the value chain the benefits from reduced costs will be captured. However the reduction in transport costs will be most significant for cassava growers because of its lower value per ton – this is the crop grown most by ethnic minority and poor farmers because it requires low initial investment. It will reduce costs for casual farm workers, who tend to be the poorest paid. It will have social benefits by improving access to schools, health facilities, etc.

2. Sensitivity Analysis

65. Sensitivity analysis was carried out on the ADB Project to test the effects of adverse changes in the key parameters that determine the benefits and costs of the Project. The sensitivity analysis (Table 26) indicates that total costs would have to increase by 20% or the traffic decrease by 33% for the EIRR to reach the threshold level of 12 percent. Traffic generation is not required, neither are travel time savings required to make the project viable.

Table 26: Sensitivity Analysis

	Change (percent)	EIRR	NPV	Switching value
Base case		14.6%	13,874	
Increase in total cost	0.2	12.0%	106	20%
Reduction in traffic	0.2	13.0%	5,357	33%
Reduction in generation	0.2	14.4%	12,879	na
Reduction in VOC	0.2	13.1%	5,907	35%
Reduce VoT saving	0.2	14.3%	12,329	na

II. ECONOMIC ASSESSMENT OF TOURISM SUBPROJECTS

A. Overview

Para no - The proposed investment within output 2 (6 percent of base cost) will be in seven community based subproject tourism sites in Dak Lak, Dak Nong, Binh Phuoc and Kon Tum Provinces.[2] For these subprojects it is proposed that the Project shall invest into site based infrastructure for community based tourism, capacity building within communities, linking sites to wider market chains in tourism, and community development programs that support the use of locally derived goods including ethnic and local agricultural output, fresh produce for local food and beverage trades and local service providers.

B. Approach and Assumption

66. The subprojects (see Appendix Supplementary Document 21 Feasibility Assessment of Tourism Subprojects [SD20]) were assessed during the project preparation. Government standard feasibility studies will be completed during implementation of the project. For the economic assessment a priority community based tourism subproject for one village from Dak Lak province was used as a representative subproject. This subproject was assessed as being indicative of the range of subproject likely to be implemented, as confirmed in SD20.

67. The approach used is based on:

(i) current provincial visitor profiles projected through for 30 years at a conservative rate of growth (70% of the 2015 level) being 11% per annum for international arrivals and 14% per annum for national arrivals
(ii) current 2015 arrivals of 550,000 – 50,000 are international arrivals (9%)
(iii) visits to the project sites “without project” are projected at the rate of 0.5% of provincial international arrivals and 0.3% of provincial national arrivals and “with project” at 0.75% and 0.5% respectively.
(iv) Average daily spend for the site visits has been set at 30% of the 2015 average daily spend of $26 per day
(v) Incremental revenues from home stay revenues are based on 10 rooms per community, with occupancy split between wet season (5% in year 6 increasing to 10% in year 20) and the dry season (ranging from 30% in year 6 increasing to 50% in year 20).
(vi) An average room tariff of US $ 15 per night
(vii) Shadow wage rate for unskilled labor – 0.70

68. Tourism benefits are adjusted to reflect the degree of leakage from the sector out of Viet Nam. Some industry studies report leakage levels of around 50% however given the dominance of the national arrivals leakage has been set to 25% of incremental revenues.

69. Further adjustment to the incremental revenue is based on the extent that new site visits substitute for other experiences. It is assumed that during the life of the project the extent of substitution is 25% of incremental revenues.

C. Visitor Projections

70. Without detailed demand estimates the projected site demand is based on conservative numbers of provincial visitors visiting the site based on current and projected visitor numbers differentiated by the international and national arrivals – Table 27. The value of site visitation is based on the 2015 average daily spend of $26 per day with 30% of this figure applied representing the likely amount of time (1/3 per day on average) at the site. The visitation value does not include the new homestays but will include cultural displays and food and beverage expenditures.

2

Table 27: Projected Site Visitation

Current Provincial Visitors	Number of visitor 2015	2016	2020	2025	2030
International	50,000	55,250	82,372	135,704	223,565
National	500,000	570,000	962,707	1,853,611	3,568,969
Site Day Visitation (Without)	**% of Provincial visitor**				
International	0.5%	276	412	679	1,118
National	0.3%	1,425	2,407	4,634	8,922
Site Day Visitation (With)	**% of Provincial visitor**				
International	0.75%	276	412	1018	1,677
National	0.50%	1,425	2,407	9,268	17,845
Incremental Growth in Day Visitors					
International		0	0	339	559
National		0	0	4,634	8,922
				4,973	9,481
Daily Spend	$8			38,792	73,954

71. Ten rooms will be developed for homestay with the projected occupancy based on low wet season occupancy and moderate dry season occupancy. The value of each night is derived from the 2015 accommodation cost component of the daily average spend per visitor day –Table 278.

Table 28: Project Homestay Occupancy

Home stay accommodation use	2021	2043	2016	2020	2025	2030	2040
Number of rooms	10	10	0	0	10	10	10
wet season Occupancy	5%	10%			104	128	175
dry season occupancy	30%	50%			597	692	881
Incremental Room nights					701	830	1056
Revenue (net per night $15)	15				27,735	48,514	160,695

72. The net incremental revenue is adjusted for losses due to leakage out of Viet Nam (25%) being half of the sector wide leakage reflecting the high degree of national visitation, and also for substitutions (25%) between alternate sites – see Table 29.

Table 29: Net Revenues – Economic Revenue Adjustment

Subproject Incremental Revenue (USD)		2016	2020	2025	2030	2040
Incremental Revenue - gross	USD	-	-	49,307	86,447	285,681
Less Leakage	25%	-	-	36,980	64,685	214,260
Less Substitution losses	25%	-	-	27,735	48,514	160,695

73. The capital investment per site includes $11,000 for a feasibility study plus the capital investment estimated to be $150,000 per village site. The nature of works is based on a mix of works and services/ capacity building. The financial investment is adjusted for the unskilled labor component being

40% and a shadow wage rate factor of 0.7 reflecting the high degree of underemployment in the ethnic minority communities, especially with the loss of rubber plantation employment. The adjustment for tax and the conversion factors applied to works and goods uses the same factors developed under output 1 – See Table 30.

Table 30: Capital Investment – Economic Value

		2017	2018	2019	2020
Capex (USD'000's)		11	52.50	52.50	45.00
% unskilled Labor	40%	0%	40%	40%	40%
Share of Labor Costs			21	21	18
Economic Value of Labor	70%		19	19	16
Works and Goods			32	32	27
Economic Value Goods and Works	0.92	11	33.18	33.18	28.44
Total Economic Investment Cost		11	52.08	52.08	44.64

D. Economic Feasibility

74. Additional costs are included for maintenance of local infrastructure and services based on 2 percent per annum of the capital investment and a further capital replacement charge is based on replacing 15% of the capital value every 7 years.

75. The representative subproject is assessed to be feasible with an estimated EIRR of 15.5% - see Table 31.

Table 31: Economic Feasibility of Representative Tourism Subproject

	Representative Subproject Feasibility				
	Investment	**Maintenance**	**CAPEX**	**Net Economic**	**Subproject**
	Per site	**2% Capex**	**15% /7yr**	**Benefits**	**NCF**
	(USD)	**(USD)**	**(USD)**	**USD**	**USD**
2017	0				0
2018	-11000				-11000
2019	(52,080)				-52080
2020	(52,080)				-52080
2021	(44,640)				-44640
2022		(2,976.00)		13,036	10,060
2023		(2,976.00)		20,142	17,166
2024		(2,976.00)		22,379	19,403
2025		(2,976.00)		24,897	21,921
2026		(2,976.00)		27,735	24,759
2027		(2,976.00)		30,938	27,962
2028		(2,976.00)	-23970	34,555	7,609
2029		(2,976.00)		38,645	35,669
2030		(2,976.00)	0	43,273	40,297
2031		(2,976.00)	0	48,514	45,538
2032		(2,976.00)	0	54,452	51,476
2033		(2,976.00)	0	61,184	58,208
2034		(2,976.00)	0	68,821	65,845
2035		(2,976.00)	-23970	77,488	50,542
2036		(2,976.00)	-	87,328	84,352
2037		(2,976.00)	0	98,504	95,528
2038		(2,976.00)	0	111,203	108,227
				NPV (@12%	$43,089
				EIRR	15.5%

76. Output 2 includes sufficient budget for the seven tourism subproject investments and the supporting capacity building program. When up scaled for the additional six subprojects with the inclusion of the capacity building programs the EIRR is estimated to be 14.1% - see Table 32.

Table 32: Output 2 EIRR

Year	Output 2		
	35 site	Capacity	NCF
	NCF	Strengthening	(USD)
2017	0		0
2018	-385000	-144944.16	-529944.16
2019	-1822800	-328031.52	-2150831.52
2020	-1822800	-205973.28	-2028773.28
2021	-1562400	-83915.04	-1646315.04
2022	352,116		352,116
2023	600,818		600,818
2024	679,111		679,111
2025	767,244		767,244
2026	866,580		866,580
2027	978,670		978,670
2028	266,332		266,332
2029	1,248,430		1,248,430
2030	1,410,405		1,410,405
2031	1,593,818		1,593,818
2032	1,801,646		1,801,646
2033	2,037,274		2,037,274
2034	2,304,562		2,304,562
2035	1,768,957		1,768,957
2036	2,952,315		2,952,315
2037	3,343,491		3,343,491
2038	3,787,932		3,787,932
		NPV (@12%	$980,557
		EIRR	14.1%

III. PROJECT FEASIBILITY ASSESSMENT

77. The overall project feasibility - Table 33 includes the net cash flows from output 1 and 2 above plus the costs of output 3. For the economic analysis, an allowance for project management was included in the road construction costs-this has been deducted from the output 3 cost. The resultant EIRR of 13.4% indicates the project is feasibility at a target rate of 12%.

Table 33: Overall Project Feasibility (USD 000)

Project Feasibility				
Year	**Output 1**	**Output 2**	**Output 3**	**Total Project**
	NCF	**NCF**	**CAPEX**	**NCF**
2017		-	-2,282	-2,282
2018	-27,426	-530	-1,673	-29,629
2019	-27,426	-2,151	-922	-30,499
2020	-27,426	-2,029	-922	-30,377
2021	44,449	-1,646	-922	41,880
2022	1,584	352	-	1,937
2023	2,762	601	-	3,363
2024	4,190	679	-	4,869
2025	5,657	767	-	6,424
2026	7,718	867	-	8,585
2027	10,177	979	-	11,156
2028	13,098	266	-	13,365
2029	16,557	1,248	-	17,806
2030	18,508	1,410	-	19,918
2031	40,547	1,594	-	42,140
2032	1,287	1,802	-	3,089
2033	3,639	2,037	-	5,676
2034	6,510	2,305	-	8,814
2035	9,990	1,769	-	11,759
2036	10,796	2,952	-	13,749
2037	24,284	3,343	-	27,627
2038	30,815	3,788	-	34,603
2039	38,532	4,280		42,813
2040	74,856	4,837		79,693
NPV (@12%	13,874	1,095		8,228
EIRR	14.6%	14.1%		13.4%