

ECONOMIC ANALYSIS

A. Rationale for Public Financing of Health

1. Access to affordable, quality health services is a crucial service to ensure welfare of citizens. Currently, overall health expenditure in India is lower than other countries, on average (Table 1). Public health expenditures are only 1.3% of the gross domestic product compared to an average of 2% in low income countries. Overall, total health expenditure in India is at 4% of the gross domestic product compared to 5.3% in low income countries. The per capita health expenditure of India at \$61.4 is below the average health expenditures of lower-middle-income countries' average of \$86. India suffers from a high out-of-pocket (OOP) health expenditures; the OOP health expenditures as percentage of private health expenditures in India is 86% compared to an average of 73% both in middle income and low income countries. India is ranked 172 out of 190 countries in OOP expenditure, according to World Health Statistics (2014).

Table 1: Health Expenditures in India

Country Income Group	Health Expenditure Per Capita (Current US\$)	OOP Health Expenditure (% of private health expenditure)	Health Expenditure (% of GDP)		
			Private	Public	Total
India	61.4	86.0	2.7	1.3	4.0
High Income	4,634.5	66.3	4.7	7.5	12.2
Middle Income	262.4	78.3	2.8	3.0	5.8
Low income	31.3	73.0	3.3	2.0	5.3

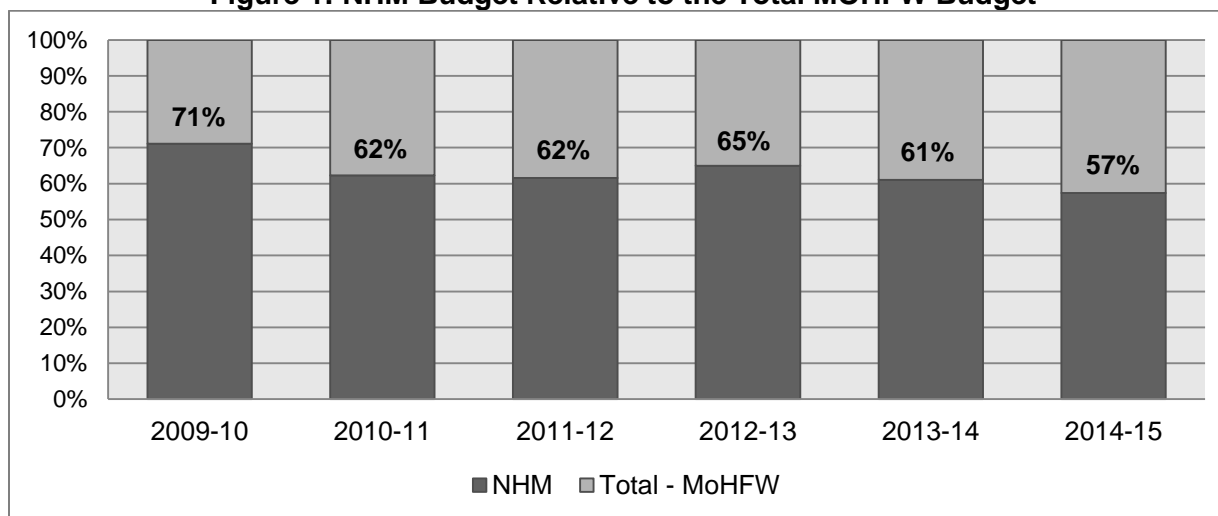
GDP = gross domestic product, OOP = out-of-pocket.

Source: World Health Organization. 2012. National Health Account Database.

2. The Government of India has been implementing health programs for accessible, equitable, and affordable health care services to reduce disparities in health across regions and communities.¹ The Twelfth Five-Year Plan, 2012–2017 sets the vision of Universal Health Coverage (UHC) for India. Under the UHC agenda, each individual will have assured access to essential health services and medicines.

3. The mechanism to institutionalize UHC in India is through the National Health Mission (NHM). The NHM was established because of the success of the National Rural Health Mission, which was expanded to include the National Urban Health Mission (NUHM). The core principles of NHM are (i) universal coverage of cashless health services, (ii) achieving quality standards of care, (iii) continuum of care by linking health facilities of various levels, and (iv) decentralized planning that gives flexibility to states and districts in customizing delivery of health care service suitable to the intended beneficiaries. The NHM budget was more than 50% of the total health budget of the Ministry of Health and Family Welfare (Figure 1).

¹ Government of India, Ministry of Health and Family Welfare. *Outcome Budget 2014–2015*. New Delhi.

Figure 1: NHM Budget Relative to the Total MOHFW Budget

MOHFW = Ministry of Health and Family Welfare, NHM = National Health Mission.

Source: Asian Development Bank estimates

4. NHM will transition to the National Health Assurance Mission (NHAM). The NHAM plans to 'assure' all citizens of preventive, promotive, and primary health care, free essential drugs and essential diagnostics, as well as insurance cover for the poor to treat serious ailments. Under the NHAM, primary health facilities are expected to play a gatekeeping role in referrals and insurance coverage for the poor. The plan will be gradually rolled out in phases. Health financing will drastically increase to create new infrastructures, improve infrastructures in existing institutions, and cover the assurance of basic services, and health insurance for the poor.

B. Economic Impact of NUHM

5. The NUHM program aims to improve the health status of the urban population by facilitating access to quality health care through a revamped public health system, partnerships, and community-based mechanism with the active involvement of the urban local bodies. The program will benefit the 377 million urban population of which 65.5 million, or 17.4% of poor population are living in urban slum areas.² The program is expected to improve the welfare of the urban population particularly the poor by decreasing the under-five mortality rate (U5MR) and maternal mortality ratio (MMR), increasing institutional deliveries and immunization rates, and reducing OOP medical expenditures, to name a few.

6. The economic analysis follows the *ADB Guidelines for the Economic Analysis of Projects* and *ADB Handbook for the Economic Analysis of Health Sector Programs*, to determine the economic viability of the program. The analysis includes the monetary quantification of achieving the program's expected outcomes in improving the welfare of the urban population.

7. **Economic costs.** The program expenditure is estimated at \$1.955 billion (INR11,729 crore) (Table 2), where 75.3% will come from the Government of India and 24.7% will be contributed by the states/union territories. Recurrent cost of \$1.535 billion (INR9,212 crore) was expected for the operation and sustainability of the program (Table 3), which is 78.5% of the

² Government of India, Ministry of Home Affairs. 2011. *2011 Census of India*. New Delhi.

total. The budget will be used to improve health facility infrastructure, increase referrals, increase efficiency of service delivery by capacity building of stakeholders, and to purchase new equipment and drugs.

Table 2: Funding Requirements Estimated for the NUHM (FY2014–2016)
(INR Crore)

Year	Government of India	States/UTs	Total
FY2014	1,939.4 ^a	646.5 ^b	2,585.9
FY2015	3,949.2	1,293.2	5,242.4
FY2016	2,939.8	961.0	3,900.8
Total	8,828.4	2,900.7	11,729.1
\$ equivalent (million)	1,471.4	483.5	1,954.9
Share	75.3%	24.7%	100.0%

^a From the revised budget (mid-year amendment) for FY2015.

^b 25% of FY2014 estimates as per the expenditure share distribution between the Government of India and states/union territories, which is 75%/25%.

INR = Indian rupee, NUHM = National Urban Health Mission, UT = union territory.

Sources: Government of India, Ministry of Health and Family Welfare. 2012. *National Urban Health Mission – EFC Note with Annexures*, 16 August, p. 12; New Delhi; Government of India, Ministry of Health and Family Welfare. 2013. *National Urban Health Mission, Framework for Implementation*, May, p. 65; New Delhi; Government of India, Ministry of Finance. 2014. *Union Budget – Notes on Demands for Grants, 2014–2015*, No. 46/Department of Health and Family Welfare, MOHFW; Information provided by the MOHFW's NHM Financial Management Group. New Delhi; Asian Development Bank estimates.

Table 3: Program Expenditure Framework (FY2014–2016)
(INR Crore)

Components	Capital Cost		Recurrent Cost		Total Cost	
	Amount	Share	Amount	Share	Amount	Share
1. Planning and mapping	-	-	72.9	0.8%	72.9	0.6%
2. Program management	-	-	663.7	7.2%	663.7	5.7%
3. Training and capacity building	-	-	448.6	4.9%	448.6	3.8%
4. Strengthening health services	2,516.7	100.0%	6,299.6	68.4%	8,816.3	75.2%
a) Outreach	4.6	0.2%	2,132.4	23.1%	2,137.0	18.2%
b) UPHC	1,300.5	51.7%	3,859.9	41.9%	5,160.4	44.0%
c) Referral	1,211.6	48.1%	31.5	0.3%	1,243.2	10.6%
d) Med College Support	-	-	-	-	-	-
e) IEC/BCC	-	-	275.7	3.0%	275.7	2.4%
5. Regulation and quality assurance	-	-	119.9	1.3%	119.9	1.0%
6. Community processes	-	-	810.6	8.8%	810.6	6.9%
7. Innovative actions and PPP	-	-	551.4	6.0%	551.4	4.7%
8. Monitoring and evaluation	-	-	242.2	2.6%	242.2	2.1%
9. National PMU	-	-	3.5	0.0%	3.5	0.0%
Total	2,517	100.0%	9,212.4	100.0%	11,729.1	100.0%

BCC = Behavioral Change Communication, IEC = Information, Education & Communication, INR = Indian rupee, NUHM = National Urban Health Mission, PPP = public–private partnership, PMU = program management unit, UPHC = urban primary health center.

Sources: Government of India, Ministry of Health and Family Welfare. 2012. *National Urban Health Mission – EFC Note with Annexures*, 16 August, pp. 23-25. New Delhi; Asian Development Bank estimates.

C. Economic Benefits and Assumptions

8. The expected benefits of the program are to reduce infant mortality rate and U5MR by 40%, reduce MMR by 50%, and increase both institutional delivery and measles immunization by 2% points per annum over 3 years for a cumulative increase of 4.7% and 4.5%, respectively,

over the remaining 3 years of the program (Table 4). The economic analysis covers a 20-year period from the start of the program. The economic costs and benefits are expressed in USD at 2014 constant prices.³ The world price numeraire was used given the standard conversion factor (SCF) of 0.95.⁴ The exchange rate used was the average of daily exchange rates from Jan 2014 to Nov 2014, which is INR 60.85 to \$1.⁵ Overall program expenditures (non-traded goods and labor) were converted to economic costs by converting to USD and applying the SCF. The economic efficiency of the program was determined by the economic internal rate of return (EIRR) and was estimated from 2014 to 2034.

Table 4: Major Assumptions Applied in the Economic Analysis

Assumption	Appraisal		
	Without Project	With Project	Targeted Change
(i) Under-five mortality (per 1,000 live births) ^a	32.0	19.2	40.0%
(ii) Maternal mortality ratio (per 100,000 live births)	178.0	89.0	50.0%
(iii) Institutional deliveries (%)	85.3	89.3	4.7%
(iv) Measles Immunization (%) ^b	88.5	92.5	4.5%
(v) Income of Survivors (\$/year)	404.5	404.5	
(vi) Out-pocket-savings (\$/beneficiary)			
1. Out-patient savings		2.9	
2. Measles immunization		7.9	
3. Treatment of complications arising from child birth at home		9.2	
4. Productivity Savings (8-day wage savings)		12.9	

Notes: Total Benefits = Income of Survivors x (i + ii) + OOP Savings x (iii + iv + vi)

^a Implies the reduction of IMR by 40% on the average

^b Proxy for complete immunization

Sources: (i) Government of India, Registrar General of India. 2012. Sample Registration System Bulletin, Statistical Report 2012; (ii) United Nations Children's Fund. United Nations Population Fund and The World Bank. 2014. *Trends in Maternal Mortality: 1990 to 2013*. Geneva; (iii) and (iv) Health Management Information System (HMIS) National aggregate (urban+rural) and will be updated after HMIS disaggregated for urban areas; (v) and (vi).4. Government of India. Ministry of Statistics & Program Implementation. National Sample Survey Office. 2014. *NSS 68th Round (July 2011 – June 2012): Informal Sector and Conditions of Employment in India*. NSS Report No. 557. India; (vi).1. *Medical Institutional Expenditures NSS KI (68/1.0): Key Indicators of Household Consumer Expenditure in India*; (vi).2. Megiddo et al. 2014. *Analysis of the Universal Immunization Program and introduction of a rotavirus vaccine in India with IndiaSim*. Vaccine 32(S): A151-A161; (vi).3. Bhojani et al. 2012. *Out-of-pocket healthcare payments on chronic conditions impoverish urban poor in Bangalore, India*. BMC Public Health 12:990; and(vi).4. Equivalent to 8-days wage savings of \$12.96 in the informal sector.

9. The overall benefit of the program is the sum of the total income of survivors and total OOP savings of beneficiaries. The total income of survivors is the product of the average lifetime annual earnings and the incremental number of survivors for U5MR and MMR. The total OOP savings is the expected expenditures saved from acquiring chronic illness due to immunization, reduced treatment cost from complications with child birth at home, improved welfare in terms of decreased out-patient expenditures and increased productivity savings.

10. **Expenditure schedule.** The economic analysis is performed on the 3-year program expenditures and annual recurrent costs in the subsequent years. The expenditure schedule is \$431 million for FY2014, \$874 million for FY2015, \$650 million for FY2016 (Table 2), and \$512

³ Per unit monetary benefits were obtained across different years, and were adjusted to 2014 prices using the average inflation from 2010 to 2013 of 10.3%. Inflation data were taken from the World Bank Databank.

⁴ ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Himachal Pradesh Clean Energy Transmission Investment Program*. Manila.

⁵ Reserve Bank of India. *Database on Indian Economy: RBI's Data Warehouse*.

million for the annual recurrent cost in FY2017 onwards.⁶ The recurrent cost was computed by annualizing the total recurrent cost for the 3-year period (Table 3), converting into USD, and applying the SCF.⁶ A premium equal to the annual beneficiary population growth rate was applied to recurrent costs.

11. **Beneficiary population.** The intended beneficiaries of the program are the people living in urban slum areas. The urban proportions by gender and age group were used to disaggregate the projected urban population counts.⁷ Beneficiaries of reduced U5MR are under 5 year old children living in urban slum areas. Effects of reduced U5MR are expected to materialize after 11 years when the first 4-year-old cohort in 2014 reaches the working age of 15 in 2025. The beneficiaries of reduced MMR and increased institutional deliveries are women aged 15 to 49 living in urban slum areas who are projected to give birth. Intended beneficiaries of improved measles immunization are infants below 12 months of age. The assumed number of women to give birth is computed by multiplying the women population count to the age-specific fertility rates in urban areas using a 5-year age interval.⁸ Beneficiaries of OOP savings were assumed to be the urban poor population living in slum areas. Beneficiaries of productivity savings were assumed to be the poor adults in the labor force.

12. **Discounted annual income.** Computation of lifetime earnings involved discounting projected annual incomes of survivors. The assumed present income is that of workers in the informal sector residing in urban areas.⁹ The discounted annual income was computed by following the procedure in the *ADB Handbook for the Economic Analysis of Health Sector Programs* (Appendix 8). The procedure computes for the average lifetime income by projecting present average income from ages 15 to 64, considering current labor participation (LP) and adult survival rate of 79.7%.¹⁰ In the absence of LP by age group, the LP for ages 15 to 24 of 37.7% was used for the said age group, while the LP of 57.9% for ages 15 to 64 was used as a conservative proxy for that of ages 25 to 64. Following the handbook, a modest 1% annual productivity growth rate and 3% improved survival rate as a result of the program were assumed. Discounted annual income was computed using the standard discount rate of 12% from the date of birth. The estimated annual income of survivors in the urban informal sector is \$404.5 per year.

13. **Out-of-pocket and productivity savings.** The program was assumed to increase OOP savings as a result of an increase in institutional delivery and measles immunization. The assumption of one episode of measles prevented for a vaccinated child will have OOP savings on the cost of seeking treatment and actual treatment cost amounting to \$7.9.¹¹ The assumed

⁶ Taxes (estimated at 10% varying from state to state depending on the nature of products) and price contingencies (estimated at 10% from World Bank Databank) excluded from economic costs.

⁷ Government of India, Ministry of Home Affairs. 2011. *2011 Census of India*. New Delhi; Health Nutrition and Population Statistics: Population estimates and projections; World Bank staff estimates based on United Nations Population Division, World Population Prospect.

⁸ Government of India, Ministry of Home Affairs. 2013. Office of the Registrar General. *Sample Registration System: Statistical Report 2012. Sample Registration System Report No. 1.*

⁹ Government of India, Ministry of Statistics & Program Implementation, National Sample Survey (NSS) Office. 2014. *NSS 68th Round, July 2011–June 2012: Informal Sector and Conditions of Employment in India. NSS Report No. 557.*

¹⁰ International Labour Organization. 2012. *Key Indicators of the Labour Market Database*; World Health Organization (WHO). 2012. *India Adult Mortality Rate. WHO Global Health Observatory Data Repository.*

¹¹ Megiddo et al. 2014. *Analysis of the Universal Immunization Program and introduction of a rotavirus vaccine in India with IndiaSim. Vaccine 32(S): A151-A161.*

amount of OOP savings for a delivery outside an institutional facility is \$9.2, resulting from reduced treatment costs of chronic conditions related to complications with child birth at home.¹²

14. An OOP savings for out-patient care was assumed to be \$2.9 per person.¹³ An assumption of 8-day wage savings of \$1.62 per day, the average daily wage in the informal sector, was applied for productivity savings.¹⁴ Labor force participation of 57.9% was used for the beneficiary population ages 15 to 64. The effectiveness of the project for OOP savings was assumed to be 50% at the onset incremented by 10% points per year and is capped at 90%. For productivity and out-patient care savings, individual-specific receptivity to the project was assumed to be at 50% probability.

15. **Disability-adjusted life years saved.** The disability-adjusted life years (DALYs) saved were indirectly estimated.¹⁵ DALYs for 2014 to 2034 were computed by rebasing the 2010 DALY with the estimated year's population using the formula in Appendix 7 of the *ADB Handbook for the Economic Analysis of Health Sector Programs*. The computation of DALYs assumes that health welfare remains constant, and increase in DALY across years is due to increase in the beneficiary population. Estimated DALYs used for U5MR is the total DALY of the causes of child death; DALY for MMR and institutional deliveries is the total DALY of the cause of maternal death; and DALY used for measles for under-five age group is as published.¹⁶

D. Program Economic Internal Rate of Return

16. The cost-benefit analysis shows that the positive effects of reduced U5MR and MMR, and increased OOP savings outweighs the economic costs of the program. Projections indicate that the urban poor population will have accrued benefits if health outcome targets were achieved. The computed EIRR (Table 5) of 13.0% and net present value (NPV) of \$33.1 million indicate that the program is economically viable. Furthermore, the cost per DALY saved from the program over the 20-year period is estimated at \$43.8 (Table 6), which is considered cost effective.

¹² Bhojani et al. 2012. *Out-of-pocket healthcare payments on chronic conditions impoverish urban poor in Bangalore, India*. *BMC Public Health* 12:990.

¹³ Government of India, Ministry of Statistics & Program Implementation, National Sample Survey Office. 2014. *NSS 68th Round, July 2011–June 2012: Key Indicators of Household Expenditure in India*. *NSS Report KI(68/1.0)*. India.

¹⁴ 8 days considers the average duration of acute febrile malaria. Kumar et al. 2007. *Burden of malaria in India: retrospective and prospective view*. *Am J Trop Med Hyg.* 77(6S):69-78.

¹⁵ Institute for Health Metrics and Evaluation. *Global Burden of Disease Database*.

¹⁶ Causes of death among children were from the World Health Organization (WHO) Global Health Observatory Data Repository. Causes include HIV/AIDS, diarrheal diseases, whooping cough, tetanus, measles meningitis, encephalitis, malaria, lower respiratory infections, preterm birth complications, neonatal encephalopathy and sepsis, other infectious, communicable and non-communicable diseases, neonatal disorders and anomalies, nutritional deficiencies, and injuries; Say et al. 2014. *Global causes of maternal death: a WHO systematic analysis*. *Lancet Global Health* 2(6):e323; Causes of maternal death are abortion, maternal hemorrhage, hypertension, sepsis, obstructed labor, and other maternal disorders.

Table 5: EIRR Calculation

Year	Total Cost (\$'000)	Decreased Mortality		Out-of-pocket Savings			Total Benefits (\$'000)	Net Benefits (\$'000)
		U5MR (\$'000)	MMR (\$'000)	Increased Institutional Delivery (\$'000)	Increased Measles Immunization (\$'000)	Out-patient Care and Productivity Savings (\$'000)		
2014	323,781	-	180	-	-	241,477	241,657	(82,124)
2015	656,403	-	330	227	171	296,616	297,344	(359,058)
2016	488,420	-	457	465	350	354,170	355,441	(132,980)
2017	384,496	-	467	476	358	414,191	415,491	30,995
2018	393,398	-	478	487	366	476,753	478,084	84,686
2019	402,464	-	489	498	374	487,739	489,101	86,637
2020	411,694	-	500	509	383	498,925	500,318	88,624
2021	421,105	-	512	521	392	510,331	511,755	90,650
2022	430,655	-	523	533	401	521,904	523,361	92,706
2023	440,364	-	535	545	410	533,671	535,160	94,796
2024	450,199	-	547	557	419	545,589	547,112	96,913
2025	460,166	2,352	559	569	428	557,668	561,577	101,411
2026	470,253	8,877	571	582	437	569,892	580,360	110,107
2027	480,481	18,887	584	594	447	582,287	602,799	122,319
2028	490,823	25,769	596	607	457	594,820	622,249	131,427
2029	501,289	32,957	609	620	466	607,505	642,157	140,868
2030	511,876	33,716	622	633	476	620,335	655,783	143,907
2031	522,580	34,490	635	647	486	633,307	669,564	146,984
2032	533,386	35,278	648	660	496	646,402	683,485	150,099
2033	544,304	36,078	661	673	506	659,633	697,552	153,249
2034	555,330	36,892	675	687	517	672,996	711,766	156,436
							EIRR =	13.0%
							NPV (@12%) =	33,116

EIRR = economic internal rate of return, MMR = maternal mortality ratio, NPV = net present value, U5MR = under-five mortality rate.

Sources: Asian Development Bank estimates

Table 6: DALYs Saved

Year	Total Cost (\$'000)	Net Benefits (\$'000)	Number of DALYs Saved	Cost per DALY Saved (\$)
2014	323,781	(82,124)	2,940,406	110.1
2015	656,403	(359,058)	6,251,694	105.0
2016	488,420	(132,980)	9,263,370	52.7
2017	384,496	30,995	9,479,075	40.6
2018	393,398	84,686	9,698,549	40.6
2019	402,464	86,637	9,922,043	40.6
2020	411,694	88,624	10,149,599	40.6
2021	421,105	90,650	10,381,619	40.6
2022	430,655	92,706	10,617,049	40.6
2023	440,364	94,796	10,856,415	40.6
2024	450,199	96,913	11,098,875	40.6
2025	460,166	101,411	11,344,599	40.6
2026	470,253	110,107	11,593,269	40.6
2027	480,481	122,319	11,845,413	40.6
2028	490,823	131,427	12,100,378	40.6
2029	501,289	140,868	12,358,416	40.6
2030	511,876	143,907	12,619,422	40.6
2031	522,580	146,984	12,883,312	40.6
2032	533,386	150,099	13,149,707	40.6
2033	544,304	153,249	13,418,859	40.6
2034	555,330	156,436	13,690,707	40.6
Total	9,873,469		225,662,774	43.8

DALY = disability adjusted life year.

Source: Asian Development Bank estimates

D. Sensitivity Analysis

17. The results of the economic analysis were subjected to a sensitivity analysis to determine the impact of adverse changes in key assumptions on the efficiency of the program. The EIRR was recomputed given four scenarios: (i) program cost increased by 5%, (ii) population coverage short by 5%, (iii) benefits from reduced mortality short by 5%, and (iv) benefits from OOP savings short by 5%.

18. The lowest recalculated economic NPV (ENPV) is negative \$121 million with a corresponding EIRR of 8.3% (Table 7). The EIRR is most sensitive to the scenario of decreased population coverage. Mitigating actions should be focused on reaching all the targeted beneficiaries. The overall results of the sensitivity analysis based on the EIRR and ENPV, support the feasibility of the program if deviations in the assumptions were kept to a minimum.

Table 7: EIRR Sensitivity Analysis Results

Change Variable	Percent Change in Variable	Recalculated EIRR	ENPV (12%) (\$'000)	Sensitivity Indicator
1. Increased Costs	5%	8.5%	(119,662)	6.85
2. Population Coverage Short by	5%	8.3%	(121,318)	7.20
3. Benefits from Reduced Mortality Short by	5%	12.9%	31,297	0.08
4. Benefits from Out-of-pocket Savings Short by	5%	8.4%	(119,499)	7.09
Base EIRR =		13.0%		
Base NPV @12% =		33,116	\$'000	

EIRR = economic internal rate of return, ENPV = economic net present value.

Source: Asian Development Bank estimates