

SECTOR M

ECONOMIC AND FINANCIAL ANALYSIS

VOLUME 3: SUPPORTING REPORT

SECTOR M: ECONOMIC AND FINANCIAL ANALYSIS

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SECTOR M ECONOMIC AND FINANCIAL ANALYSIS

1. CHAPTER OVERVIEW

This chapter presents the results of the project appraisal under the following subtitles;

- (1) Economic Analysis
- (2) Financial Analysis
- (3) Background Information for the above analyses

Economic analysis is to appraise economic viability of the proposed projects from the viewpoint of national welfare by means of a conventional cost-benefit analysis by estimating project benefit as damage of flood that could be avoided as a result of the proposed projects. The proposed projects include a wide range of structural measures along with a non-structural measure. In the economic analysis, the proposed three (3) structural measures are analyzed with particular reference to project impact on reduction of damages caused by floods. The non-structural measure aims at protection of human life from more extensive flood damage that is not envisaged in the proposed structural measures. As part of the economic analysis, sensitivity of the project viability is subsequently assessed on possible changes in cost and benefit.

In Pakistan, as in many other developing countries, the cost of providing flood protection (inclusive of investment and O/M costs) has generally been subsidized, that is, the cost of providing the service is not recovered directly from beneficiaries. This practice is justified by the fact that flood protection service has the characteristics of a public goods, and accordingly, the government has taken on the responsibility of providing and managing the service. However, the project requires the initial investment cost at nearly Rs.7,615 million and recurrent O/M cost at nearly Rs. 5.4 million (current price level) per year, which will directly impose a fiscal burden to the central government.

Financial Analysis was conducted to address the issue of fiscal impact of the project, in part because a concern has been expressed regarding the project size. The fiscal analysis draws on results of recent public expenditure reviews.

The last part of the report, *Background Information regarding the Analysis*, gives the relevant background data on which the analysis stands. The data presented herein are limited to those necessary to trace the logic of analysis. Detailed data are given in Volume IV Data Book.

2. ECONOMIC ANALYSIS

2.1 Project Benefit

The project objective is to protect human life from flood damages, private as well as public assets in the flood-prone communities of the twin cities of Islamabad and Rawalpindi. The project is further expected to promote economic growth and thus reduce poverty through strengthened capability for increasing income and employment by underpinning and encouraging private sector activity. The project objective will be achieved through installation of various flood protection structures including i) Community Pond, ii) Flood Diversion Channel and iii) Channel Improvement.

The people living in the study area estimated at nearly 1.8 million people (ca. 280 thousands households) will be benefited directly and indirectly through reduction in potential loss of human life and damages on personal and public properties. The major project benefit is estimated as the value of damages from floods that could be avoided as a result of the construction of the flood protection structures. Project benefit will accrue to individual households as avoided damages to the house structure and personal properties including furniture, vehicle, and electric appliances. In addition to the damages to individual households, the damage that accrues to business sectors is the largest contributor to the entire project benefit, as they possess a significant amount of merchandise in stock. The indirect benefits would accrue from the saved expenses on emergency operation, additional expenses on medication, loss of business opportunities. Other benefit in private sector would include expenses for clean up of floors filled with mud and necessary pump operation for drainage from the affected houses and buildings. In the public sector, there would have large damages on the infrastructure such as bridges and roads.

The total project benefit generated upon completion of the structures proposed in the Long-term Project is estimated at Rs 598 million as a total average annual damage. In individual households, the quantified benefits include: the avoided damages on (i) individual houses amounting to Rs 160 million and (ii) personal properties amounting to Rs 107 million. In business sector, major benefits quantified are avoided damages to (i) structure totaling at Rs 93 million, (ii) contents totaling at Rs 168 million including merchandise, equipment and machinery and (iii) loss of business opportunity resulted from suspension of business during the flood affected period totaling at Rs 57 million.

In addition, a substantial number of people residing in the area would have non-quantified benefits, including: (i) medium-term impacts on the regional economy though the avoided suspension of efficient transportation as a result of floods and damages on road and bridge, (ii) long-term impacts on the regional economy and (ii) associated trauma of the flood damage.

2.2 Economic Analysis

The overall economic internal rate of return (EIRR) of the Long-term Project is estimated at 10 %, with a net present value (NPV) of Rs 121 million at a discount rate of 10%. As shown in the table below, rates of return declines from the Urgent Project to the Long-term Project indicating diminishing efficiency on investment.

Table R M. 1 EIRR and NPV of the Proposed Structural Measures

Subproject	EIRR	NPV (Rs million) discounted @ 10%	B/C ratio
1. Urgent Project	22.4 %	932	2.3
2. Short-term Project	12.8 %	647	1.3
3. Long-term Project	10.4 %	121	1.0

The major assumptions used in the analysis pertain to (1) period of analysis, (2) without the project case, (3) increasing value in damage over time, (4) opportunity cost of labor, (5) cost of land, (6) foreign exchange rate, (7) economic cost of projects and (8) others. Details of these assumptions are as described hereinafter:

- (1) *Period of analysis:* The project period of analysis is set at 50 years in line with the expected life of the major structure to be constructed. This period include the first 10 years needed to complete the construction of the projects and the balance of the period for O/M.
- (2) *Without Project Case:* The conditions to be realized upon the completion of the channel improvement work under the ADB loan¹ {Loan No. 1260 Pak (SF)} is assumed as the Without Project Case. Reduction of the flood damages with 100 years frequency is the ultimate target of the Long-term Project, while those with 13 years and 25 years frequencies are the target of the Urgent Project and the Short-term Project respectively.
- (3) *Increasing Value in Damage Over Time:* Although the value of assets such as housing and personal properties are expected to increase during the entire project life as a result of the economic growth and, partly, as a result of the project, possible increment in asset value was not assumed². Therefore, the benefits with the project included in the EIRR calculation are conservative in that no increases over and above the present asset value have been included.
- (4) *Opportunity cost of labor:* The opportunity cost of unskilled labor was derived by adjusting the prevailing market wage rate by a factor of 0.75 in line with estimated level of seasonal unemployment and underemployment in the subproject areas³. Since the

¹ "Urban Water Supply and Sanitation Project Phase-1 for Rawalpindi City"

² An analysis in the project area assumed that the value increase at the rate of 20 percent per annum on account of high increase in population and conversion of present fallow land to residential area.

³ Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Islamic Republic of Pakistan for the Second Flood Protection Sector Project, October 1997 (PRP:PAK28165)

project is not so large as to significantly alter the demand for labor relative to its supply, the wage rate in the areas is not expected to change as a result of the project.

- (5) Cost of land acquisition: The lands acquired for the project include those owned by the government as well as personally owned lands with a total cost less than 10 % of the total project cost. As for the land owned by the government, it is currently used as a central reservation of the road network in Islamabad city, therefore, the cost of land is not included in the economic analysis considering the opportunity cost of the land. On the other hand, the land owned by private individuals is assessed at its market price with consideration on the urban and/or peri-urban settings where land market is rather competitive.
- (6) Foreign exchange rate factor: As the exchange rate of the rupee was pegged de facto to the dollar until July 20, 2000, a project analysis in 1997 used a shadow exchange rate factor of 1.15. The exchange rate of the rupee is currently not considered so significantly distorted as before since it is currently managed floating with no prearranged path⁴. In this analysis, an exchange rate factor of 1.0 has been used considering the fact that the cost of the foreign portion is very limited in the project.
- (7) Economic costs of projects: The financial costs of the projects comprise costs for i) construction, ii) compensation, iii) physical contingencies, iv) consultancy service, v) administration, vi) price contingencies and vii) taxes, all of which are expressed in the local market price.
- (8) Economic costs of projects were derived by subtracting price contingencies and taxes from the financial costs of the projects, then, adjusting it by the opportunity cost of labor and land for the construction cost. The economic costs of local materials were based on the prevailing market prices assumed to remain unchanged in real terms at constant 2002 price.
- (9) Other important assumptions: In line with the project objective, the project costs included in the analysis are those for the components with the flood protection purpose. In this context, the cost for and the benefit from installing additional park facility aiming at enhancement of aesthetic and recreational value of the park are not incorporated in the analysis. The cost as well as the benefit of the Flood Forecasting and Warning System (FFWS) is also not included on the grounds that 1) valuation of human life in monetary term is not generally accepted and 2) technical constraints remain in estimating the

⁴ In the managed floating with no prearranged path, the monetary authority influences the movements of the exchange rate through active intervention in the foreign exchange market without specifying, or precommitting to, a preannounced path for the exchange rate.

number of affected people as it significantly varies by social and natural settings of the flood occurrence.

2.3 Sensitivity Analysis

Sensitivity analysis indicated significant economic robustness of the Urgent Project and the Short-term Project. However, as the EIRR of the Long-term Project is marginally beyond the opportunity cost of the capital, 10 % reduction in benefit or 10 % overrun in project cost pushes EIRR below the threshold.

In the analysis of the Urgent Project, the project economic viability is most sensitive to a delay in the realization of benefits. Unlike agricultural projects where the price of farm products, a determinant of benefit, frequently fluctuates in the international market, external variables that significantly affect the project benefit are not extensively present. However, due to the nature of flood prevention project, damage reduction benefits from the flood prevention measures begin to accrue as soon as the measures are installed. Therefore, a delay in benefit realization may take place when completion of construction is overdue. The preparation and construction of the structures of the project would, therefore, need to be closely monitored during the supervision with particular reference to timely resource mobilization of the Pakistan side by facilitated interagency coordination.

Table R M. 2 Summaries of Sensitivity of EIRR on Different Scenarios

Projects	Base Case	10% Reduction in Benefit	10% Cost Overrun	Delay in Benefit ⁵	
				1 year delay	3 year delay
1 Urgent Project	22.4	20.4	20.5	19.1	15.2
2 Short-term Project	12.8	11.6	11.7	11.5	9.7
3 Long-term Project	10.4	9.3	9.4	9.4	8.0

The project is less sensitive to an increase in investment costs or a decrease in benefit. With a longer construction period, the Long-term Project indicated a neutral pattern of reduction in EIRR among the compared scenarios in the analysis.

The switching values (percentage change of variable needed to reduce the Net Present Value below zero) are as follows: In the Long-term Project, reduction in benefit or cost overrun at merely 3.5 % each will push the project's EIRR below the threshold.

Table R M. 3 Switching Values

Variable changed	Switching Value	Urgent Project	Short-term Project	Long-term Project
Increase in investment and O&M costs		+134 %	+ 28 %	+ 3.5 %
Reduction in Benefit		- 57 %	- 22 %	- 3.4 %

⁵ In the analysis, the variable changed is only limited to the benefit stream of the cash flow.

3. FINANCIAL ANALYSIS

3.1 Overview

In Pakistan, as in many other developing countries, the cost of providing flood protection including investment and O/M costs has been subsidized in most case, that is, the cost of providing the services is not recovered directly from beneficiaries. This practice is justified by the fact that flood protection service have the characteristics of a public goods, and accordingly, the government has taken on the responsibility of providing and managing the service.

The analysis was conducted to address the issue of fiscal impact of the project, in part because a concern has been expressed regarding the project size. The fiscal analysis draws on results of recent public expenditure reviews.

Overall, the analysis indicated that additional expense with implementation of the project is deemed to fall within the financial capacity of the government.

3.2 Public Expenditure Reviews

3.2.1 Overall Budget

Table below summarizes the consolidated budget of the year 2001-02. The total revenue amounts to Rs 625.4 billion against Rs 837.6 billion in total expenditure. An overall fiscal deficit of Rs.212.2 billion is financed through external and domestic sources.

Table R M. 4 Consolidated Budget for 2001-02(Federal and Provincial)

	(in Rs. Billion)	Percentage
Revenue		
a) Tax Revenue	486.0	78%
b) Non-Tax Revenue	139.4	22%
<i>Total Revenue</i>	625.4	100%
Expenditure		
a) Current Expenditure	705.5	84%
Federal	535.4	64%
Interest	257.0	31%
Defense	149.6	18%
Others.	124.0	15%
Provincial	170.1	20%
b) Development Expenditure	132.1	16%
PSDP**	127.0	15%
<i>Total Expenditure</i>	837.6	100%
Overall Fiscal Deficit		
Financing		
i) External	148	70%
ii) Domestic	64.2	30%

Source: Economic Survey 2001-2002 (Modified Budget Estimated)

Among the items in the expenditure side, interest payment is the largest single item of the total as well as current expenditures. Its share in the total expenditures is 31 percent in 2001-02. In

absolute term, interest repayment is Rs.257 billion in 2001-02. It has increased at almost 15 percent per annum during the second half of the 1990s. The Public Sector Development Programme (PSDP) at nearly Rs 130 billion, from which the Project is expected to be funded, accounts for 15 percent of the total expenditures.

As the government has financed investment by borrowing from outside the budget, public debt has been growing by an average rate of 18 percent and 15 percent per annum in the 1980s and 1990s respectively. As percentage of the GDP, public debt was 55.9 percent in 1980, increased to 97 percent in 2000, and is forecasted to cross 100 percent by mid-2000.

Table R M. 5 Public Debt in 2002

Items	Public Debt (Rs Billion)	As % of Public Debt	As % of GDP	As % of Revenue
Debt Payable in Rupees	1638.6	-45%	44%	262%
Debt Payable in Foreign Exchange	1968.5	-55%	53%	315%
Total Public Debt	3607.2	-100%	97%	577%

Source: Economic Survey 2001-2002
End March

3.2.2 Public Sector Development Program (PSDP)

The table below presents PSDP budget until 2010. The total PSDP budget of the federal and the provincial governments for 2001-02 is about Rs 130 billion. The PSDP budget will reach Rs418 billion at the end of the planning period in 2010 with an annual growth rate at 14%. The total expected expenditure of the program amounts to Rs 2,540 billion until 2010.

Table R M. 6 PSDP Budget (Ten Year Perspective Development Plan 2001-2011)

No Sector	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
A. Federal Program	75	109	133	144	156	172	188	206	217	228	1,623
1 Water	9	29	47	41	42	44	46	51	58	60	426
2 Power	14	14	15	23	28	33	35	39	35	32	267
3 Transport & Commun.	22	25	27	30	33	36	39	41	44	48	346
4 Others	30	41	44	50	54	59	68	75	81	88	585
B. Special Areas	5	7	8	11	14	17	19	22	25	27	157
C. New Projects/Programs	0	0	0	2	4	8	12	19	37	66	148
Total (Federal)	80	112	142	157	175	197	219	246	280	321	1,927
D. Province	50	38	39	45	52	59	68	78	88	97	813
1 Provincial ADPs	30	33	34	37	43	49	56	64	73	82	500
2 Khushal Pakistan Program	7	5	5	8	9	10	12	14	15	15	100
3 Drought Relief Program	10	0	0	0	0	0	0	0	0	0	10
4 Devolution Plan	3	0	0	0	0	0	0	0	0	0	3
Grand Total	130	150	180	202	227	255	287	324	367	418	2,540

Unit: Billion Rs in current prices

Source: Ten Year Perspective Development Plan 2001-11 and Three Year Development Programme 2001-04, Planning Commission, September, 2001

3.2.3 Water Sector in PSDP

Ministry of Water and Power, under which the Federal Flood Commission is organized, administers the budget for the programs in the water and the power sectors.

In the fiscal year 2001-02, nearly Rs 9 billion of budget was allocated to water sector programs out of Rs 130 billion of the total PSDP budget. The water sector contributes about 7% in the total PSDP in the year 2001-02, which is gradually raised to Rs 60 billion by the end of the planning stage, totaling at Rs 426 billion during the 10 years until 2010.

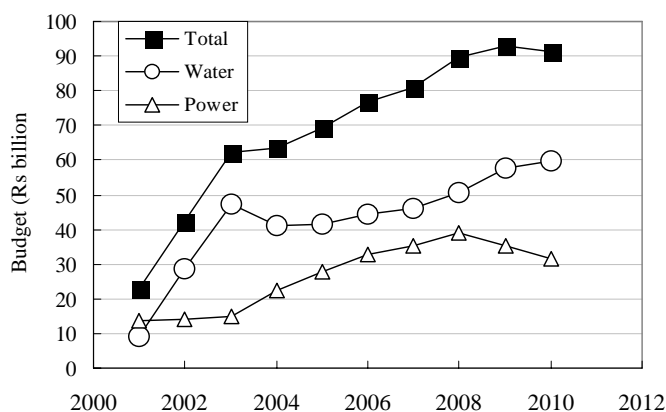


Fig. R M. 1 Budget for Federal Program under the Ministry of Water and Power in Ten Year Perspective Development Plan 2001-2011

3.2.4 National Flood Protection Plans

With growing recognition on the effects of flood on national economy, the federal government has increased the budget for the National Flood Protection Plans that is included in Water Sector Programs. According to the draft National Flood Protection Plan-III issued on May 2001, it is planned to invest Rs 26.0 billion in total for the period until 2012.

Table R M. 7 Cost of National Flood Protection Plan

Phase	Overall investment (Rs in billion)
NFPP-I	1.6
NFPP-II	8.6
NFPP-III	26.0

Source: Draft National Flood Protection Plan-III (1988-2012), May 2001, Federal Flood Commission
The document gives overall investment value with a breakdown, though annual disbursement of the sector is not available.

Normal flood protection program, out of which project OM cost will be allocated, amounts to Rs 2,400 million for the period from 2000 to 2012.

Table R M. 8 Normal/Emergent Flood Protection Program for the period from 2000 to 2012

Region	Estimated Cost (Rs in million)	Annual Average (Rs million/annum)
Punjab	1,080	83
Other Provinces	1,320	102
Total cost	2,400	185

3.3 Project Funding

Under the proposed project, the level of subsidy for flood protection will consist of (i) the one-time investment cost of developing subprojects, with a total cost of about Rs 7.6 billion; and (ii) the recurrent O/M cost of completed facilities, about Rs 5.4 million a year for the Long-term Project. The cost of the project imposes a fiscal burden during the entire project life though counterpart funding of the Pakistani side, recurrent OM cost and loan repayment. For implementation of the project, loan arrangements through multilateral and/or bilateral aid agencies along with grant aid scheme need to be looked into.

Table R M. 9 Total Cost of the Projects

Project	Investment Cost (Rs million)
Urgent Project	1,266
Short-term Project	4,229
Long-term project	7,615

Current prices

To assess the scale of the expenditure of the government, three cases of fund sources for investment cost were assumed as outlined in the table below.

Case 1 assumed that a loan is extended to 75% of the total investment cost with an interest rate at 4.29 % having 35 years maturity including 10 years of grace period. In this case, the government needs to allocate budget for 25% of the project cost, which will accrue during the project construction period until 2012. (Table M4).

Case 2 and Case 3 assume that grant aid assistance is extended to the Urgent Project costing at Rs 1,267 million. It assumed that 75% of the rest of the project cost is financed by the same condition as given in the case 1. (Table M5).

In Case 3, more preferable loan conditions are additionally assumed with an interest rate at 1.30% having 30 years maturity including 10 years of grace period. In this case, expenditure of the government during the construction period is same as Case 2, though, the repayment burden will smaller and repayment period will be shorter. (Table M6).

Table R M. 10 Fund Source Cases

Case	Loan Conditions*		
	Repayment Period including a grace period	Grace Period	Interest Rate
Case 1	35 years	10 Years	4.29%**
Case 2	35 years	10 Years	4.29%
Case 3	30 years	10 years	1.30%***

* Transaction cost such as commitment fee is not incorporated in the assumptions.

** Indicative Lending Rates for Loans under the LIBOR-Based Loan Facility as of May 26, 2003., 10 year Fixed Swap Rate at 3.690% plus 0.6% per annum for lending spreads for public sector borrowers.

*** JBIC's lending rate of JBIC's Yen loan conditions for Pakistan

3.4 Fiscal Impact

3.4.1 Impact of the Project on PSDP

The table below compares annual disbursement schedule of the project investment and the country's budget in PSDP and its programs in the water sector and thus indicate the impact of the project investment on the budget. The project investment is scheduled to begin from 2003 and continues until 2012. Readers may need to note that the budget for PSDP and programs for water sector are expressed in the current price, while, the project cost includes price contingency in the table. Therefore the percentage increase in the table may overestimate the impact.

Table R M. 11 Project Investment and Ten Year Perspective Development Plan 2001-2011

Item		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
W/O Project	PSDP	130,000	150,000	180,000	202,000	227,000	255,000	287,000	324,000	367,000	418,000		
	Water Sector	9,000	28,500	47,100	41,100	41,500	44,300	46,000	50,700	57,600	59,800		
Project Investment				69	813	1,194	1,066	1,086	658	676	680	707	666
W/ Project	PSDP	130,000	150,000	180,069	202,813	228,194	256,066	288,086	324,658	367,676	418,680		
	Water Sector	9,000	28,500	47,169	41,913	42,694	45,366	47,086	51,358	58,276	60,480		
Impact on PSDP		0.00%	0.00%	0.04%	0.40%	0.53%	0.42%	0.38%	0.20%	0.18%	0.16%		
Impact on Water Sector		0.00%	0.00%	0.15%	1.98%	2.88%	2.41%	2.36%	1.30%	1.17%	1.14%		

Source: Ten Year Perspective Development Plan 2001-11 and Three Year Development Programme 2001-04
W/O =without, W/=with

The project will have only 1.4 % increase in the total budget for water sector programs, which varies between 0.1 and 2.88% in comparison with annual disbursement schedule of the program. The corresponding figure for the PSDP up to 2012 in total is merely 0.25% with varying impacts ranging from 0.04% to 0.53%. As far as the current size of the expenditure is concerned, there will be a negligible incremental fiscal burden on the federal governments. Additional annual expense with implementation of the project is, therefore, generally deemed to fall within the capacity of the government. In addition, recent development in tax reform including broadened tax base has increased tax revenue of the central government by 13% from 2001-02 to the 2002-03, which is expected to contribute to balanced budget in the future.

3.4.2 Impact on Interest Payment

The table below presents the governmental expenditure necessary for the project implementation with three cases concerning possible fund sources (See Table R.M.10 for assumptions). As presented in the Table M.4 through M.6, implementation of the project requires repayment of loan after a grace period of 10 years totaling around Rs 0.29 billion - Rs 0.48 billion on an annual basis depending on the loan conditions. Additional payment of interest

ranged between Rs 0.051 to Rs 0.248 billion, which will push up interest payment burden by merely 0.1% point at maximum. Therefore it is deemed that the repayment is also within the financial capacity of the government.

Table R M. 12 Impact on Interest Payment

Case	Repayment Period (Years)	Annual Loan Repayment (Rs million)			Impact on Interest Payment
		Total	Principal	Interest	
Case 1	11 - 35	477	228	248	0.097%
Case 2	11 - 35	387	190	196	0.076%
Case 3	11 - 30	290	238	51	0.020%

3.4.3 Impact of the Project on NFPP

The project will result in a 24 % increase in the budget for NFPP-III with an additional investment until 2012. The OM cost of the project requires Rs 5.4 million annually (in the current price), which will result in 3% increase on an annual basis in the Emergent Flood Protection Program categorized under the NFPP-III.

Table R M. 13 Comparison with NFPP-III

	Without Project	With Project	Increment
NFPP-III (Rs billion in current Price)	26.0	32.2	24%
Normal/Emergent Flood Protection Program (Rs million / annum in current price)	185	190.4	3%

3.4.4 NFPP-III and Ten Year Perspective Development Plan 2001-2011

NFPP-III is currently under revision by the Federal Flood Commission. The proposed project’s budget is expected to be incorporated into the revised NFPP-III, which will be submitted to the Planning Commission through the Ministry of Water and Power. It is further expected to be incorporated into the three years rolling programs under Ten Year Perspective Development Plan 2001-2011 through coordination among the concerned ministries.

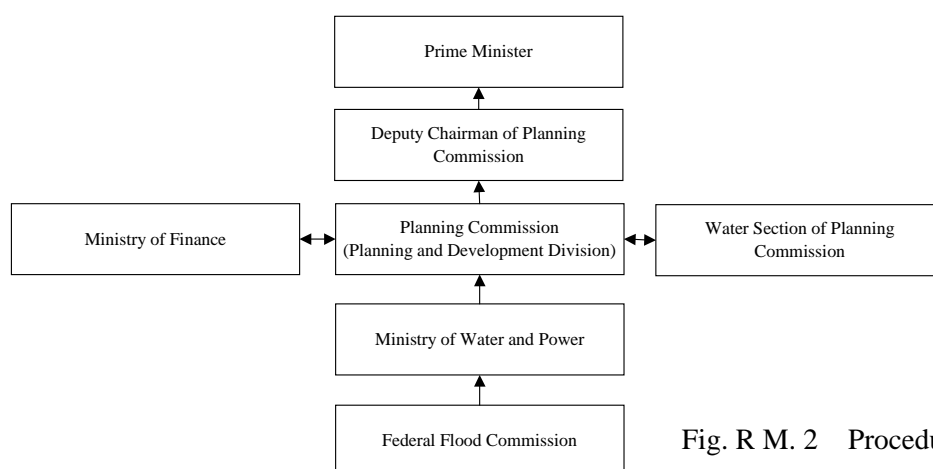


Fig. R M. 2 Procedure of the Budget Preparation

4. BACKGROUND INFORMATION REGARDING THE ANALYSIS

4.1 Benefit

4.1.1 Formula

The project benefits are quantified as the damages of flood that are expected to be avoided as a result of the proposed projects. The total damage of flood is expressed as the simple formula presented below.

Table R M. 14 Damage Quantification Formula

Formula	Damage	=	Unit Damage Rate	x	Flooded Area
Unit	(Rs)		(Rs/m ²)		(m ²)
Source			Interview Survey on the flood 2001		Mathematical model
Note			Separately estimated on [Residential] and [Business] parts with further breakdowns		Computed according to water depth separately for Islamabad and Rawalpindi

4.1.2 Unit Damage Rate

Unit damage rates are separately estimated for the Residential Part and Business Part from the data collected in the Interview Survey. Geographical divisions (Islamabad/Rawalpindi) and subdivisions in the business sector (Commercial and Industry), both available in the original data of the interview survey, were respectively unified to secure data reliability under a constraint in a limited sample size. A critical data review and an effort were made to minimize statistical errors and sampling bias.

Table R M. 15 Unit Damage Rate of Residential Part

Category		Water Depth	(Rs/m ²)
Direct Damage	Structure	0.3m - 1 m	586
		1m - 2 m	1,172
		2 m-	1,856
	Content	0.3m - 1 m	546
		1m - 2 m	857
		2 m-	1,091
Indirect Damage	Emergency Measures	0.3m - 1 m	0
		1m - 2 m	2
		2 m-	5
	Loss of Income	0.3m - 1 m	11
		1m - 2 m	20
		2 m-	29
	Others	0.3m - 1 m	5
		1m - 2 m	9
		2 m-	13

Source: JICA Study Team 2003

Table R M. 16 Unit Damage Rate of Business Part

Damage Category		Water Depth	(Rs/m ²)
Direct Damage	Structure	0.3m - 1 m	2,899
		1m - 2 m	5,799
		2 m-	9,181
	Content	0.3m - 1 m	7,266
		1m - 2 m	11,417
		2 m-	14,531
Indirect Damage	Business Suspension	0.3m - 1 m	2,214
		1m - 2 m	3,751
		2 m-	5,166
	Emergency Measure	0.3m - 1 m	4
		1m - 2 m	7
		2 m-	10
	Flood Proofing Activity	0.3m - 1 m	250
		1m - 2 m	250
		2 m-	250

Source: JICA Study Team

4.1.3 Flooded Area

The land area flooded was obtained from mission's engineer who performed flood simulation analysis. The tables below present the results.

Table R M. 17 Reproduction of 2001 Flood

Inundation Depth	Reproduction of 2001 Flood		
	Islamabad (km ²)	Rawalpindi (km ²)	Total (km ²)
0.3m - 1m	0.2	1.6	1.8
1m - 2m	0.3	2.2	2.5
Greater than 2m	0.7	4.2	4.9
Total	1.2	8.0	9.2

Source: JICA Study Team

Table R M. 18 Estimated Flood Inundation Depth and Area (Without Project Case)

Inundation Depth	100yr Flood			50yr Flood			25yr Flood		
	Islamabad	Rawalpindi	Total	Islamabad	Rawalpindi	Total	Islamabad	Rawalpindi	Total
0.3m - 1m	0.32	1.67	1.98	0.12	0.92	1.04	0.13	0.68	0.81
1m - 2m	0.23	1.52	1.74	0.16	1.17	1.33	0.16	0.69	0.85
2m<	0.58	3.28	3.86	0.37	1.81	2.18	0.14	0.79	0.93
Total	1.12	6.46	7.59	0.65	3.90	4.54	0.43	2.17	2.59

Unit: km²

Source: JICA Study Team

Table R M. 19 Estimated Flood Inundation Depth and Area (With the Urgent Project Case)

Inundation Depth	100yr Flood			50yr Flood			25yr Flood		
	Islamabad	Rawalpindi	Total	Islamabad	Rawalpindi	Total	Islamabad	Rawalpindi	Total
0.3m - 1m	0.27	1.44	1.71	0.12	0.86	0.98	0.07	0.38	0.45
1m - 2m	0.21	1.39	1.60	0.13	0.97	1.10	0.10	0.43	0.52
2m<	0.49	2.77	3.26	0.27	1.33	1.59	0.09	0.50	0.59
Total	0.97	5.60	6.57	0.51	3.15	3.67	0.26	1.30	1.56

Unit: km²

Source: JICA Study Team

Table R M. 20 Estimated Flood Inundation Depth and Area (With the Short-term Project Case)

Inundation Depth	100yr Flood			50yr Flood			25yr Flood		
	Islamabad	Rawalpindi	Total	Islamabad	Rawalpindi	Total	Islamabad	Rawalpindi	Total
0.3m - 1m	0.21	1.11	1.32	0.07	0.54	0.61	0.00	0.00	0.00
1m - 2m	0.18	1.19	1.37	0.09	0.63	0.72	0.00	0.00	0.00
2m<	0.35	1.99	2.34	0.15	0.72	0.87	0.00	0.00	0.00
Total	0.74	4.29	5.03	0.30	1.89	2.20	0.00	0.00	0.00

Unit: km²

Source: JICA Study Team

4.1.4 Land Use Pattern in the Flooded Area

Land use statistics specifically prepared for the flood affected area is not available, the land use pattern within the flooded area such as area for residence, business operation was derived from data presented in the Master Plan of Rawalpindi, assuming a homogeneous land use pattern within the flood affected area.

Table R M. 21 Land Use Pattern in Flooded Area

Land Use Pattern	Percentage
Residential	58%
Business	7%
Educational	8%
Roads	14%
Others	13%

Source: Rawalpindi Master Plan

In the analysis, it is assumed that residential and business areas account for 58% and 7% respectively, which is based on the land use in RMC area in Rawalpindi.

This assumption renders the analysis conservative because the land use in the whole RMC area covers a wider space than the flood affected area including unused land in contrast with the densely populated flooded area.

4.1.5 Damage

The table below presents a sample procedure for estimating the damage value. The sample employ data for residential part in Rawalpindi with an inundation depth deeper than 2m in the Without Project Case of 100 year return period.

Table R M. 22 Damage Calculation Process (Damage to Structure)

Water Depth	Damage (Rs Billion)	Unit Damage Rate	Flooded Area (m ²)
0.3m-1m	577	= 586	x 1.7 x 10 ⁶ x 58%
1m-2m	1,019	= 1,172	x 1.5 x 10 ⁶ x 58%
2m-	3552	= 1,856	x 3.3 x 10 ⁶ x 58%

The said calculation process was repeated for households and business in Islamabad and Rawalpindi separately on direct and indirect damage with further damage breakdowns.

As for the damage in the public sector, it was assumed that the damage declines from 100 year return period to 10 year return period proportionally to the damage in the private sector. As the frequency of the flood 2001 is lower than 100 years period, use of flood 2001 data as the value corresponding to 100 years return period have also secured conservative position of the analysis. (Refer to Table R M. 19).

Table R M. 23 Estimation of Damage in Public Sector

Standard Project Flood	Total Damage in Private Sector (Rs thousands)	Percentage	Loss to infrastructure (Rs thousands)	Emergency Operation Expenses (Rs thousands)
10 year	0	0%	0	0
25 year	15,397,881	30%	46,448	10,480
50 year	29,991,696	59%	90,470	20,413
100 year	50,672,479	100%	152,853	34,489

Note: Refer to Table R.L.3 and R.L.4.

4.1.6 Average Annual Damage

The table below presents the procedure of computing the total average annual damage. The damage value in the third column includes those in private sector and public sector. The total value of Without Project Case is Rs 597 million, which corresponds to the average annual damage of the flood with 100 years frequency. Accordingly, the damages at the cost of Rs 597 million is expected to be avoided on the average annual term as a result of the Long-term Project. With the Urgent Project, the damage of the flood will be reduced to Rs. 379 million, therefore, the benefit of the Urgent Project is the difference between the Without Project Case and With Urgent Project Case estimated at Rs 218 million on the average annual term. Similarly, the benefit of the Short-term Project is the difference between Without Project Case and With Short-term Project Case, therefore, it amounts to Rs 430 million.

Table R M. 24 Tabulation of Average Annual Damage Without Project Case

Project	Frequency	Damage (Rs billion)	Percent Chance	Average Damage (Rs billion)	Changes in Frequency	Contribution to average annual damages (Rs million)	Total (Rs million)
(1)	(2)	(3)	(4)=1/(2)	(5)=[(3) ₀ +(3) ₁]/2	(6)=(4) ₀ -(4) ₁	(7)=(5) x (6)	
Without Project	10	0	10.0%				597
	25	7.09	4.00%	3.54	6.00%	212.7	
	50	13.46	2.00%	10.28	2.00%	205.5	
	100	22.44	1.00%	17.95	1.00%	179.5	
With Urgent Project	13	-	7.69%				379
	25	4.35	4.00%	2.17	3.69%	80.3	
	50	10.55	2.00%	7.45	2.00%	149.0	
	100	19.37	1.00%	14.96	1.00%	149.6	
With Short-term Project	10	-	10.00%				167
	25	-	4.00%	-			
	50	6.21	2.00%	3.11	2.00%	62.1	
	100	14.70	1.00%	10.46	1.00%	104.6	

The figure below further schematically describes the procedure. The average annual damages are the sum of the area under the Damage Frequency Curves.

The benefit of the Urgent Project is the area enclosed by the curves of ‘Without Project Case’ and ‘With Urgent Project Case’. Similarly, the benefit of the Short-term Project is the area enclosed by the curves of ‘Without the Project Case’ and ‘With the Short-term Project Case’. As for the Long-term Project, the benefit is the sum of the area under the damage frequency curve of the Without Project Case.

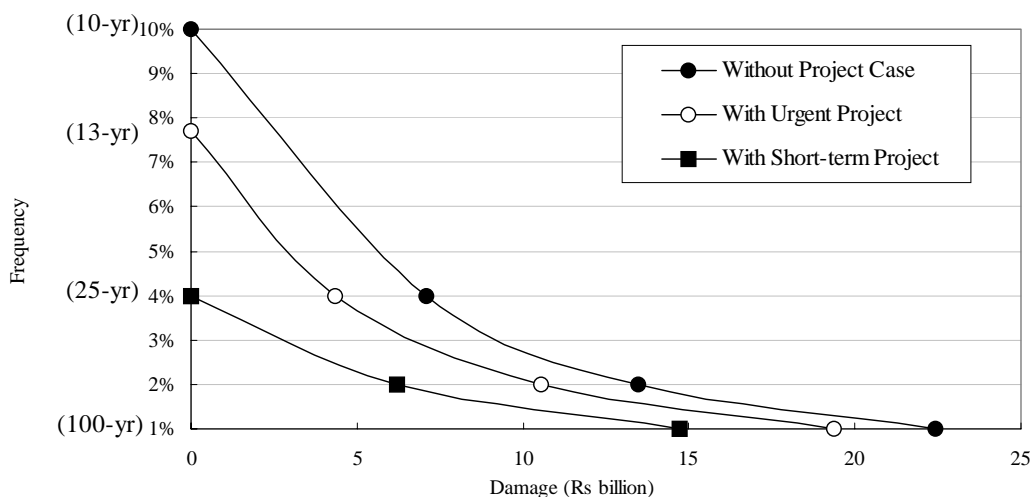


Fig. R M. 3 Damage Frequency Curve

Table R M. 25 Benefit of the Urgent Project

Damage Category		Damage Items	Benefit (Rs million)
Direct Damage Avoided	Individual Households	Structure	58.58
		Content	39.28
	Business Entities	Structure	34.21
		Content	61.75
	Public	Infrastructure	1.08
Indirect Damage Avoided	Individual Households	Loss of Income	0.96
		Emergency Measures	0.12
		Others	0.42
	Business Entities	Business Suspension	20.90
		Emergency Measures	0.04
		Flood Proofing Activity	1.34
	Emergency Operation		0.24
		218.92	

Table R M. 26 Benefit of the Short-term Project

Damage Category		Damage Items	Benefit (Rs million)
Direct Damage Avoided	Individual Households	Structure	115.40
		Content	77.22
	Business Entities	Structure	67.38
		Content	121.39
	Public	Infrastructure	2.34
Indirect Damage Avoided	Individual Households	Loss of Income	1.88
		Emergency Measures	0.23
		Others	0.82
	Business Entities	Business Suspension	41.12
		Emergency Measures	0.08
		Flood Proofing Activity	2.62
	Emergency Operation		0.53
		431.02	

Table R M. 27 Benefit of the Long-term Project

Damage Category		Damage Items	Benefit (Rs million)
Direct Damage Avoided	Individual Households	Structure	159.78
		Content	106.89
	Business Entities	Structure	93.30
		Content	168.03
	Public	Infrastructure	4.07
	Indirect Damage Avoided	Individual Households	Loss of Income
Emergency Measures			0.33
Others			1.14
Business Entities		Business Suspension	56.93
		Emergency Measures	0.11
		Flood Proofing Activity	3.62
Emergency Operation		0.92	
			597.72

4.2 Cash Flow of Economic Project Cost

The annual disbursement of the economic project cost are estimated as listed in the following Tables based on the assumptions as described in the foregoing subsection 2.2.

Table R M. 28 Investment Cost of the Projects in Economic term

Year	Urgent Project		Short-term Project		Long-term Project	
	Financial	Economic	Financial	Economic	Financial	Economic
2003	69,437	52,751	69,437	52,751	69,437	52,751
2004	690,881	457,283	813,424	568,943	813,424	568,943
2005	506,349	325,727	1,194,298	902,094	1,194,298	902,094
2006			1,065,946	855,350	1,065,946	855,350
2007			1,085,733	750,690	1,085,733	835,328
2008					657,608	487,886
2009					676,240	482,056
2010					679,588	465,915
2011					706,772	465,915
2012					666,161	419,381

Unit: Rs thousands

Table R M. 29 OM cost of the Projects in Economic Term

Year	Urgent Project	Short-term Project	Long-term Project
	Economic	Economic	Economic
2006	3,124	3,124	3,124
2007	3,124	3,124	3,124
2008	3,124	4,557	3,124
2009	3,124	4,557	3,124
2010	3,124	4,557	3,124
2011	3,124	4,557	3,124
2012	3,124	4,557	3,124
2013	3,124	4,557	5,146
2014	3,124	4,557	5,146
2015	3,124	4,557	5,146
2052	3,124	4,557	5,146

Unit: Rs thousands

SECTOR M

TABLES

Table M.1 Economic Analysis of the Urgent Project

Year	Cost Stream			Benefit Stream			Net Benefit		
	Investment cost	OM Cost	Total Cost	Direct Benefit	Indirect Benefit	Total Benefit	Inclusive of Direct and Indirect	Inclusive of Direct benefit	
2003	52,751	0	52,751	0	0	0	-52,751	-52,751	
2004	457,283	0	457,283	0	0	0	-457,283	-457,283	
2005	325,727	0	325,727	0	0	0	-325,727	-325,727	
2006	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2007	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2008	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2009	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2010	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2011	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2012	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2013	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2014	-	3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2015		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2016		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2017		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2018		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2019		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2020		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2021		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2022		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2023		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2024		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2025		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2026		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2027		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2028		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2029		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2030		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2031		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2032		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2033		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2034		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2035		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2036		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2037		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2038		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2039		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2040		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2041		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2042		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2043		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2044		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2045		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2046		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2047		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2048		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2049		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2050		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2051		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
2052		3,124	3,124	194,903	24,019	218,921	215,797	191,779	
Unit: Rs thousands							NPV@10%	932,336	753,925
							EIRR	22.40%	20.20%
							B/C ratio	2.34	2.09

Table M.2 Economic Analysis of the Short-term Project

Year	Cost Stream			Benefit Stream			Net Benefit		
	Investment cost	OM Cost	Total Cost	Direct Benefit	Indirect Benefit	Total Benefit	Inclusive of Direct and Indirect Benefit	Inclusive of Direct benefit	
2003	52,751	0	52,751	0	0	0	-52,751	-52,751	
2004	568,943	0	568,943	0	0	0	-568,943	-568,943	
2005	902,094	0	902,094	0	0	0	-902,094	-902,094	
2006	855,350	3,124	858,474	194,903	24,019	218,921	-639,553	-663,572	
2007	750,690	3,124	753,814	194,903	24,019	218,921	-534,892	-558,911	
2008	-	4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2009	-	4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2010	-	4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2011	-	4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2012	-	4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2013	-	4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2014		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2015		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2016		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2017		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2018		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2019		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2020		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2021		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2022		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2023		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2024		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2025		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2026		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2027		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2028		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2029		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2030		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2031		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2032		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2033		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2034		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2035		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2036		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2037		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2038		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2039		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2040		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2041		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2042		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2043		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2044		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2045		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2046		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2047		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2048		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2049		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2050		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2051		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
2052		4,557	4,557	383,730	47,291	431,021	426,464	379,173	
Unit: Rs thousands							NPV@10%	646,814	325,885
							EIRR	12.80%	11.40%
							B/C ratio	1.28	1.14

Table M.3 Economic Analysis of the Long-term Project

Year	Cost Stream			Benefit Stream			Net Benefit		
	Investment cost	OM Cost	Total Cost	Direct Benefit	Indirect Benefit	Total Benefit	Inclusive of Direct and Indirect Benefit	Inclusive of Direct benefit	
2003	52,751	0	52,751	0	0	0	-52,751	-52,751	
2004	568,943	0	568,943	0	0	0	-568,943	-568,943	
2005	902,094	0	902,094	0	0	0	-902,094	-902,094	
2006	855,350	3,124	858,474	194,903	24,019	218,921	-639,553	-663,572	
2007	835,328	3,124	838,452	194,903	24,019	218,921	-619,531	-643,550	
2008	487,886	4,557	492,443	383,730	47,291	431,021	-61,422	-108,713	
2009	482,056	4,557	486,613	383,730	47,291	431,021	-55,592	-102,883	
2010	465,915	4,557	470,472	383,730	47,291	431,021	-39,451	-86,742	
2011	465,915	4,557	470,472	383,730	47,291	431,021	-39,451	-86,742	
2012	419,381	4,557	423,938	383,730	47,291	431,021	7,083	-40,208	
2013	-	5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2014	-	5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2015		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2016		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2017		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2018		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2019		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2020		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2021		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2022		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2023		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2024		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2025		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2026		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2027		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2028		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2029		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2030		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2031		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2032		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2033		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2034		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2035		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2036		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2037		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2038		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2039		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2040		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2041		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2042		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2043		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2044		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2045		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2046		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2047		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2048		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2049		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2050		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2051		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
2052		5,146	5,146	532,068	65,654	597,722	592,576	526,922	
Unit: Rs thousands							NPV@10%	121,139	-269,023
							EIRR	10.40%	9.20%
							B/C ratio	1.04	0.92

Table M.4 Government Expenditure (Case 1)

Year	Project Cost		Fund Source			Loan Repayment			Loan Outstanding (Period End)
	Investment	O/M	Grant assistance	Pakistan Government	Loan Portion	Principal	Interest	Total	
2003	69,437	0	0	17,359	52,078	0	0	0	54,312
2004	813,424	0	0	203,356	610,068	0	0	0	692,882
2005	1,194,298	0	0	298,575	895,724	0	0	0	1,656,757
2006	1,065,946	3,810	0	266,486	799,459	0	0	0	2,561,587
2007	1,085,733	3,962	0	271,433	814,300	0	0	0	3,520,713
2008	657,608	6,053	0	164,402	493,206	0	0	0	4,186,116
2009	676,240	6,295	0	169,060	507,180	0	0	0	4,894,639
2010	679,588	6,547	0	169,897	509,691	0	0	0	5,636,176
2011	706,772	6,808	0	176,693	530,079	0	0	0	6,430,787
2012	666,161	7,081	0	166,540	499,621	0	0	0	7,227,722
2013	0	8,272	0	0	0	228,456	248,494	476,950	7,060,842
2014	0	8,603	0	0	0	228,456	248,494	476,950	6,886,802
2015	0	8,947	0	0	0	228,456	248,494	476,950	6,705,296
2016	0	9,305	0	0	0	228,456	248,494	476,950	6,516,003
2017	0	9,677	0	0	0	228,456	248,494	476,950	6,318,589
2018	0	10,064	0	0	0	228,456	248,494	476,950	6,112,707
2019	0	10,467	0	0	0	228,456	248,494	476,950	5,897,992
2020	0	10,885	0	0	0	228,456	248,494	476,950	5,674,066
2021	0	11,321	0	0	0	228,456	248,494	476,950	5,440,533
2022	0	11,774	0	0	0	228,456	248,494	476,950	5,196,982
2023	0	12,244	0	0	0	228,456	248,494	476,950	4,942,982
2024	0	12,734	0	0	0	228,456	248,494	476,950	4,678,086
2025	0	13,244	0	0	0	228,456	248,494	476,950	4,401,826
2026	0	13,773	0	0	0	228,456	248,494	476,950	4,113,714
2027	0	14,324	0	0	0	228,456	248,494	476,950	3,813,243
2028	0	14,897	0	0	0	228,456	248,494	476,950	3,499,881
2029	0	15,493	0	0	0	228,456	248,494	476,950	3,173,075
2030	0	16,113	0	0	0	228,456	248,494	476,950	2,832,250
2031	0	16,757	0	0	0	228,456	248,494	476,950	2,476,804
2032	0	17,428	0	0	0	228,456	248,494	476,950	2,106,109
2033	0	18,125	0	0	0	228,456	248,494	476,950	1,719,511
2034	0	18,850	0	0	0	228,456	248,494	476,950	1,316,328
2035	0	19,604	0	0	0	228,456	248,494	476,950	895,848
2036	0	20,388	0	0	0	228,456	248,494	476,950	457,330
2037	0	21,203	0	0	0	228,456	248,494	476,950	0

Unit : Rs thousands

Table M.5 Government Expenditure (Case 2)

Year	Project Cost		Fund Source			Loan Repayment			Loan
	Investment	O/M	Grant assistance	Pakistan Government	Loan Portion	Principal	Interest	Total	Outstanding (Period End)
2003	69,437	0	69,437	0	0	0	0	0	0
2004	813,424	0	690,881	30,636	91,907	0	0	0	95,850
2005	1,194,298	0	506,349	171,987	515,962	0	0	0	638,058
2006	1,065,946	3,810	0	266,486	799,459	0	0	0	1,499,187
2007	1,085,733	3,962	0	271,433	814,300	0	0	0	2,412,735
2008	657,608	6,053	0	164,402	493,206	0	0	0	3,030,606
2009	676,240	6,295	0	169,060	507,180	0	0	0	3,689,558
2010	679,588	6,547	0	169,897	509,691	0	0	0	4,379,397
2011	706,772	6,808	0	176,693	530,079	0	0	0	5,120,092
2012	666,161	7,081	0	166,540	499,621	0	0	0	5,860,799
2013	0	8,272	0	0	0	190,456	196,292	386,748	5,725,479
2014	0	8,603	0	0	0	190,456	196,292	386,748	5,584,354
2015	0	8,947	0	0	0	190,456	196,292	386,748	5,437,175
2016	0	9,305	0	0	0	190,456	196,292	386,748	5,283,681
2017	0	9,677	0	0	0	190,456	196,292	386,748	5,123,603
2018	0	10,064	0	0	0	190,456	196,292	386,748	4,956,657
2019	0	10,467	0	0	0	190,456	196,292	386,748	4,782,550
2020	0	10,885	0	0	0	190,456	196,292	386,748	4,600,973
2021	0	11,321	0	0	0	190,456	196,292	386,748	4,411,607
2022	0	11,774	0	0	0	190,456	196,292	386,748	4,214,117
2023	0	12,244	0	0	0	190,456	196,292	386,748	4,008,154
2024	0	12,734	0	0	0	190,456	196,292	386,748	3,793,356
2025	0	13,244	0	0	0	190,456	196,292	386,748	3,569,343
2026	0	13,773	0	0	0	190,456	196,292	386,748	3,335,719
2027	0	14,324	0	0	0	190,456	196,292	386,748	3,092,074
2028	0	14,897	0	0	0	190,456	196,292	386,748	2,837,975
2029	0	15,493	0	0	0	190,456	196,292	386,748	2,572,976
2030	0	16,113	0	0	0	190,456	196,292	386,748	2,296,609
2031	0	16,757	0	0	0	190,456	196,292	386,748	2,008,385
2032	0	17,428	0	0	0	190,456	196,292	386,748	1,707,797
2033	0	18,125	0	0	0	190,456	196,292	386,748	1,394,313
2034	0	18,850	0	0	0	190,456	196,292	386,748	1,067,381
2035	0	19,604	0	0	0	190,456	196,292	386,748	726,424
2036	0	20,388	0	0	0	190,456	196,292	386,748	370,839
2037	0	21,203	0	0	0	190,456	196,292	386,748	0

Unit : Rs thousands

Table M.6 Government Expenditure (Case 3)

Year	Project Cost		Fund Source			Loan Repayment			Loan Outstanding (Period End)
	Investment	O/M	Grant assistance	Pakistan Government	Loan Portion	Principal	Interest	Total	
2003	69,437	0	69,437	0	0	0	0	0	0
2004	813,424	0	690,881	30,636	91,907	0	0	0	93,102
2005	1,194,298	0	506,349	171,987	515,962	0	0	0	616,981
2006	1,065,946	3,810	0	266,486	799,459	0	0	0	1,434,854
2007	1,085,733	3,962	0	271,433	814,300	0	0	0	2,278,393
2008	657,608	6,053	0	164,402	493,206	0	0	0	2,807,630
2009	676,240	6,295	0	169,060	507,180	0	0	0	3,357,903
2010	679,588	6,547	0	169,897	509,691	0	0	0	3,917,873
2011	706,772	6,808	0	176,693	530,079	0	0	0	4,505,775
2012	666,161	7,081	0	166,540	499,621	0	0	0	5,070,466
2013	0	8,272	0	0	0	238,070	51,473	289,543	4,846,839
2014	0	8,603	0	0	0	238,070	51,473	289,543	4,620,305
2015	0	8,947	0	0	0	238,070	51,473	289,543	4,390,826
2016	0	9,305	0	0	0	238,070	51,473	289,543	4,158,363
2017	0	9,677	0	0	0	238,070	51,473	289,543	3,922,879
2018	0	10,064	0	0	0	238,070	51,473	289,543	3,684,333
2019	0	10,467	0	0	0	238,070	51,473	289,543	3,442,687
2020	0	10,885	0	0	0	238,070	51,473	289,543	3,197,899
2021	0	11,321	0	0	0	238,070	51,473	289,543	2,949,928
2022	0	11,774	0	0	0	238,070	51,473	289,543	2,698,734
2023	0	12,244	0	0	0	238,070	51,473	289,543	2,444,275
2024	0	12,734	0	0	0	238,070	51,473	289,543	2,186,507
2025	0	13,244	0	0	0	238,070	51,473	289,543	1,925,388
2026	0	13,773	0	0	0	238,070	51,473	289,543	1,660,875
2027	0	14,324	0	0	0	238,070	51,473	289,543	1,392,924
2028	0	14,897	0	0	0	238,070	51,473	289,543	1,121,489
2029	0	15,493	0	0	0	238,070	51,473	289,543	846,525
2030	0	16,113	0	0	0	238,070	51,473	289,543	567,987
2031	0	16,757	0	0	0	238,070	51,473	289,543	285,827
2032	0	17,428	0	0	0	238,070	51,473	289,543	0

Unit : Rs thousands