

SECTOR 9 ECONOMIC AND FINANCE

SUPPORTING REPORT

SECTOR 9 ECONOMICS AND FINANCE

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Annexes

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9.1 SOCIO-ECONOMIC PERSPECTIVES

9.1.1 Administrative Perspective

The whole territory of the nation of Tajikistan consists of 4 regions (hereinafter referred to as “Oblast” as called locally) of Sughd Oblast, Khatlon Oblast, Oblast under Direct Republican Jurisdiction (Direct Rule Districts, locally abbreviated as “DRS”), and Gorno Badakhshan Autonomous Oblast (GBAO). The capital of the nation is Dushanbe City. Under those 4 Oblasts, there are 58 districts (hereinafter referred to as “Rayon” as called locally) in total. The targeted area of the Project is located in the Hamadoni Rayon belonging to the Khatlon Oblast. The central city of the Hamadoni Rayon is Moskva.

9.1.2 Population

According to the Statistics¹, population of the nation has been increased from 6,001 (1,000 people) in 1998 to 6,780 (1,000 people) in 2004 with 2.06 % of annual population growth. Following table shows a summary of population growth of the Republic of Tajikistan with share rate of urban population to the total with illustration.

Table R 9.1.1 Population in Whole the Nation of Tajikistan

In Figures				(Unit: 1,000)		In Trend Illustrated				
Year	Total	Urban	Rural	Share Rate of Urban Population to the Total Population						
1998	6,001	1,596	4,405	26.60%						
1999	6,127	1,624	4,503	26.50%						
2000	6,250	1,663	4,588	26.60%						
2001	6,376	1,690	4,686	26.50%						
2002	6,507	1,718	4,789	26.40%						
2003	6,640	1,760	4,880	26.50%						
2004	6,780	1,790	4,990	26.40%						
Annual Average Growth Rate	2.06%	1.93%	2.10%							

Source: Regions of the Republic of Tajikistan, 2003, 2004 and 2005, Committee of Statistics of the Republic of Tajikistan.

The population of the Capital Dushanbe City has been increased from 539 (1,000 people) in 1998 to 632 (1,000 people) in 2004 as shown in the following table as for reference.

Table R 9.1.2 Population in Dushanbe, the Capital City

(Unit: 1,000)				
Year	Total	Urban	Rural	Share Rate of Urban Population to the Total Population
1998	539	539	0	100.00%
1999	561	561	0	100.00%
2000	576	576	0	100.00%
2001	589	589	0	100.00%
2002	604	604	0	100.00%
2003	619	619	0	100.00%
2004	632	632	0	100.00%
Annual Average Growth Rate	2.69%	2.69%	-	

¹ “Regions of the Republic of Tajikistan”, 2003, 2004 and 2005, Committee of Statistics of the Republic of Tajikistan.

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Annual average population growth rate is rather higher than that for the whole nation because of the capital.

Flood prone area as the target area of the Project is located in Hamadoni Rayon. The population of Hamadoni Rayon has been increased from 103 (1,000 people) in 1998 to 117 (1,000 people) in 2004 as shown in the following table.

Table R 9.1.3 Population in Hamadoni District (Hamadoni Rayon)

Year	Total	Share Rate of Urban		Share Rate of Urban Population to the Total Population
		Urban	Rural	
1998	103	18	85	17.10%
1999	106	18	88	17.10%
2000	108	19	90	17.10%
2001	110	19	92	17.00%
2002	112	19	93	16.90%
2003	115	20	95	17.00%
2004	117	20	97	17.00%
Annual Average Growth Rate	2.16%	2.06%	2.18%	

On the other hand, the Resident Consciousness Survey² has made clear family size of the households in Hamadoni Rayon as shown in the following figure.

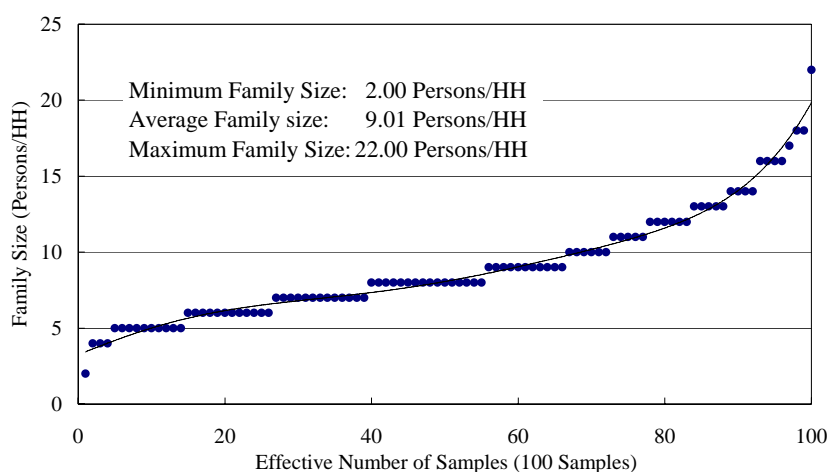


Fig. R 9.1.1 Average Family size in Hamadoni Rayon

If the average family size can be assumed as 9.01 persons per households (HHs) as a result of the said Survey as mentioned above, number of HHs in Hamadoni Rayon can be estimated at 12,857 HHs as of 2004.

9.1.3 Economic Active Population (Labor Force)

According to another statistics³, around 1/3 of the total population is a share rate of economic active population that has been increased from 1,655 (1,000 people) in 2000 to 1,986 (1,000 people) in 2005.

Among them, unemployment population has gradually been decreased from 50 (1,000 people) in 2000 to 42 (1,000 people) in 2005 with share rates from 3.02 % in 2000 to 2.14 % in 2005 to

² The Resident Consciousness Survey made by JICA Study Team, May, 2006, by means of interview for 100 residents selected by sampling method.

³ Statistics being opened to the public on the official web site of the National Bank of Tajikistan (NBT) as of September 2006.

the total economic active population as shown in the Table R 9.1.3 hereunder. This may be rather good intimation for the economic activities in Tajikistan.

Source: The National Bank of Tajikistan (NBT).

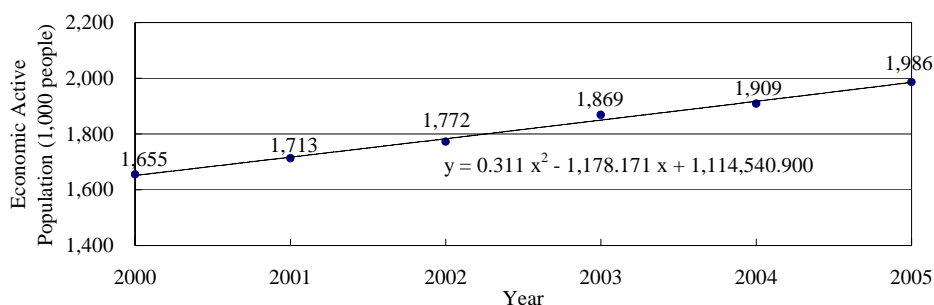


Fig. R 9.1.2 Economic Active Population

Source: The National Bank of Tajikistan (NBT).

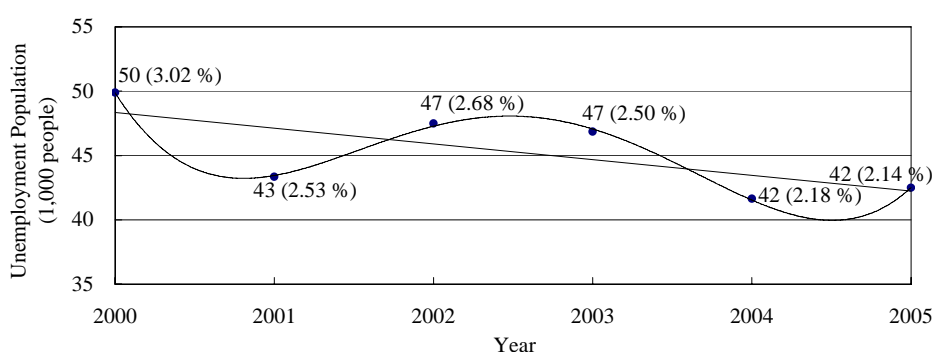


Fig. R 9.1.3 Unemployment Population

9.1.4 Financial Status of the Government

Detail financial status of the Government is undergoing to collect. Temporally, the Team has gotten information from the National Bank of Tajikistan as shown in the following table.

Table R 9.1.4 Overall Financial Status of the Government

	(million TJS)					
	2000	2001	2002	2003	2004	2005
Revenue in Total	1,393	2,381	3,226	4,789	6,445	8,028
Expenditure in Total	1,409	2,221	2,894	4,228	6,347	8,116
Capital Investment	489	791	828	1,332	2,759	3,200
Surplus(+)/Deficit(-)	-16	161	331	561	98	-88

Source: The National Bank of Tajikistan (NBT).

As indicating in the table, the current financial status seems to be steadily kept since 2000 except in 2000 and in 2005. Following table shows a balance of payment of Tajikistan.

Table R 9.1.5 Balance of Payment of Tajikistan

	(million TJS)					
Description	2000	2001	2002	2003	2004	2005
1. Current Account	-115	-141	-55	-15	-170	-59
Balance on Goods and Services	-141	-282	-452	-467	-669	-1,336
Income	-38	-43	-114	-215	-171	-127
Balance on Transfers	64	184	512	667	671	1,405
2. Capital and Financial Account	206	228	315	230	-269	464
Financial Account	206	228	315	230	-269	464
3. Net Errors and Omissions	-33	-29	-72	-93	-97	-241
4. Overall Balance	-23	-46	83	84	12	17
5. Financial Items	23	46	-16	-84	-12	-17

Source: The National Bank of Tajikistan (NBT).

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Details of the balance of payment the Government of Tajikistan are shown in Annex 9.1.1. According to the said balance of payment, the overall balance of the state finance is positive since 2002.

9.1.5 Gross Domestic Products (GDP)

Gross Domestic Products (GDP) at current price level in Tajikistan seems to have been steadily increased since 2000 till 2005 as shown in the following table.

Table R 9.1.6 Gross Domestic Products (GDP) and Per-Capita GDP

Description	2000	2001	2002	2003	2004	2005	2006	
Current Price								
GDP at current Price (million TJS)	1,807	2,512	3,345	4,758	6,158	7,201	9,272	Average Annual
GDP at current Price (million US\$)	972	1,081	1,202	1,555	2,071	2,306	2,812	Increasing Ratio
Per Capita GDP (TJS/capita)	289	396	527	732	927	1,041	1,319	
Per Capita GDP (US\$/capita)	155	171	190	239	312	333	400	
Increase against Previous Year Based on Current Price								
GDP in Total	1.00	1.39	1.33	1.42	1.29	1.17	1.29	31.59%
GDP per Capita	1.00	1.11	1.11	1.29	1.33	1.11	1.22	19.71%
Real Increase against Previous Year Taking CPI into Account								
GDP in Total	1.00	1.27	1.19	1.29	1.24	1.10	1.16	20.61%
GDP per Capita	1.00	0.99	0.97	1.16	1.28	1.04	1.09	8.73%

Source: The National Bank of Tajikistan (NBT).

As shown in the above table, the per-capita GDP is US\$ 400/capita as of 2006.

According to the above table, annual average increasing ratio of GDP in total of nominal basis is more than 30 % as 31.59 %, and its Per-Capita GDP is around 20 % as 19.71 %. Comparing these figures, those of real basis are slightly higher than 20 % as 20.61 % and under 9 % as 8.73% respectively. Anyway, the per-capita GDP is to be expressed by the current price level.

Following table shows a summary of GDP by economic activities.

Table R 9.1.7 GDP by Economic Activities

Description	2000	2001	2002	2003	2004	2005	2006	Remarks
(million TJS)								
GDP in Total	1,807	2,512	3,345	4,758	6,158	7,201	9,272	
Industrial Production	1,335	1,882	2,372	3,143	3,957	4,025	n.a.	
Ginned Cotton Export	171	166	356	590	480	449	n.a.	
Aluminum Export	1,007	925	1,109	1,314	1,675	1,758	n.a.	
Transport (Cargo Carriage)	6	21	19	33	42	40	n.a.	
Electricity Production	14	14	15	16	16	17	n.a.	
Construction Materials	10	14	25	28	55	183	n.a.	
Capital Investment	104	155	158	278	990	617	n.a.	
Wheat Import	68	70	65	38	45	96	n.a.	
Others incl. Governmental Activities	270	356	690	1,222	1,052	2,223	n.a.	
Share Rate by Economic Activities	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	Average Share Rate
Industrial Production	73.90%	74.93%	70.92%	66.07%	64.27%	55.89%	n.a.	67.66%
Ginned Cotton Export	9.45%	6.60%	10.65%	12.40%	7.80%	6.24%	n.a.	8.86%
Aluminum Export	55.73%	36.82%	33.16%	27.62%	27.20%	24.41%	n.a.	34.16%
Transport (Cargo Carriage)	0.36%	0.83%	0.58%	0.69%	0.68%	0.56%	n.a.	0.62%
Electricity Production	0.79%	0.57%	0.46%	0.35%	0.27%	0.24%	n.a.	0.45%
Construction Materials	0.54%	0.54%	0.74%	0.58%	0.90%	2.54%	n.a.	0.97%
Capital Investment	5.73%	6.18%	4.72%	5.85%	16.08%	8.57%	n.a.	7.85%
Wheat Import	3.74%	2.79%	1.95%	0.80%	0.73%	1.33%	n.a.	1.89%
Others incl. Governmental Activities	14.94%	14.16%	20.63%	25.68%	17.08%	30.87%	n.a.	20.56%

Source: The National Bank of Tajikistan (NBT).

Generally speaking, the main commodities for export in Tajikistan are the cotton, aluminum and electricity. However, the production of electricity shares only at around 0.5 % as indicated in above table. On the other and, ginned cotton export and aluminum export share at around 9 % and 34 % respectively to the total GDP in average since 2000 till 2005.

9.1.6 International Balance of Trade

Following table shows a summary of international balance of trade by commodities. As indicated in the table, the trade balance in Tajikistan shows an excess of import over export during past 7 years except 2002. It means that the international trade of Tajikistan is an unfavorable balance.

Table R 9.1.8 International Balance of Trade

Description	2000	2001	2002	2003	2004	2005	2006	(1,000 TJS)
								Annual Average Increase (%)
Export in Total	1,559,844	1,513,491	1,939,667	2,441,137	2,720,152	2,837,544	4,613,475	19.81%
Aluminium -primary	806,124	925,411	1,109,006	1,314,202	1,674,904	1,758,064	3,460,909	27.49%
Cotton fibre	170,740	166,083	356,089	589,686	480,444	449,377	424,297	16.38%
Electricity	337,656	182,454	187,585	168,701	171,191	164,107	161,634	-11.55%
Other	245,324	239,543	286,987	368,548	393,614	465,995	566,635	14.97%
Import in Total	1,597,995	1,597,018	1,912,992	2,696,313	4,088,678	4,152,409	5,680,565	23.54%
Alumina	369,156	429,794	495,322	721,461	846,706	1,129,822	1,275,099	22.95%
Natural gas	121,354	61,946	62,213	74,364	82,977	83,061	115,178	-0.87%
Petroleum products	126,451	170,074	193,597	223,369	317,627	393,848	631,058	30.72%
Electricity	463,671	228,379	228,780	188,276	193,350	181,538	220,396	-11.66%
Wheat	67,536	70,547	64,923	37,987	44,718	95,832	92,418	5.37%
Flour	15,510	17,302	34,395	57,432	99,132	141,871	161,428	47.76%
Others	434,316	618,975	833,762	1,393,424	2,504,168	2,126,436	3,184,987	39.39%
Balance of Trade	-38,151	-83,526	26,675	-255,175	-1,368,526	-1,314,866	-1,067,090	

Source: The National Bank of Tajikistan (NBT).

Generally speaking, Tajikistan is an agricultural nation or one of cotton-producing countries in the world. For reference, share rates of export and import by commodities to the total amount of them are shown in the in the following table and figure.

Table R 9.1.9 Share Rate by Commodities for International Trade

Description	2000	2001	2002	2003	2004	2005	2006	Annual Average Increase (%)
								Increase (%)
Export in Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Aluminium -primary	51.68%	61.14%	57.18%	53.84%	61.57%	61.96%	75.02%	60.34%
Cotton fibre	10.95%	10.97%	18.36%	24.16%	17.66%	15.84%	9.20%	15.30%
Electricity	21.65%	12.06%	9.67%	6.91%	6.29%	5.78%	3.50%	9.41%
Other	15.73%	15.83%	14.80%	15.10%	14.47%	16.42%	12.28%	14.95%
Import in Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Alumina	23.10%	26.91%	25.89%	26.76%	20.71%	27.21%	22.45%	24.72%
Natural gas	7.59%	3.88%	3.25%	2.76%	2.03%	2.00%	2.03%	3.36%
Petroleum products	7.91%	10.65%	10.12%	8.28%	7.77%	9.48%	11.11%	9.33%
Electricity	29.02%	14.30%	11.96%	6.98%	4.73%	4.37%	3.88%	10.75%
Wheat	4.23%	4.42%	3.39%	1.41%	1.09%	2.31%	1.63%	2.64%
Flour	0.97%	1.08%	1.80%	2.13%	2.42%	3.42%	2.84%	2.09%
Others	27.18%	38.76%	43.58%	51.68%	61.25%	51.21%	56.07%	47.10%

Source: The National Bank of Tajikistan (NBT).

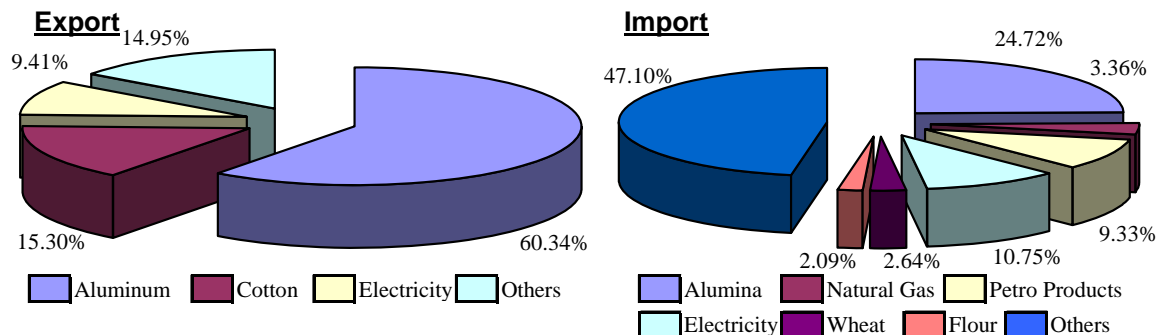


Fig. R 9.1.4 Share Rate by Commodities for International Trade

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As indicated in the above Table R 9.1.9 and Fig. R9.1.4, the share rate of cotton to the total amount of export is ranging from 9.2 % in 2006 to 24.1 % in 2003. Usually, the trade of cotton is made in one year after harvesting in November because of ginning process. Accordingly, the rather low share rate of 9.2 % in 2006 may be caused by 2005-Flood. As discussed in next sub-clause of 9.1.7, Hamadoni District and Farkhor District are the leading cotton production area in the Region Khatlon, and the cotton production in Region Khatlon is the highest in Tajikistan.

According to the other information⁴, Tajikistan is one of the agricultural countries, so that the state exports agricultural products as fruits and vegetables, silk and silk products, animal skins and tobacco other than cotton. However, the share rate of cotton in export has been increased from 80 % in 1999 to 91 % in 2003. Also, the said information has made clear that almost of all fruits and vegetables are exported to Russia being increased from 92 % in 1999 to 99 % in 2003, added by way of cautioning to readers.

In aluminum, the amount of import of alumina shares at around 25 % to the total import amount. The import of alumina is mainly from Russia. Using this material, the Tajik Aluminum Plant makes aluminum primary products, and exports them to Russia sharing around 60 % to the total export in amount.

9.1.7 Industrial Perspective

The industry Tajikistan consists of more than 90 sectors and types of production. Most of enterprises of the industry have been re-established into joint stock and private ownership forms after issuing and coming into effect of the Low No.464 on Privatization of State Property in the Republic of Tajikistan” on the date of May 16, 1997.

(1) Non-Ferrous Metal Sector

Among them, the aluminum processing is showing the most dynamic activities in Tajikistan at the present. As shown in Table R 9.1.7 “GDP by Industry of Origin”, the annual average share rate of whole industrial sectors is around 68 % to the GDP in total, and in this share rate, only export of aluminum shares at around 34 % also to GDP in total in average during past 6 years. It means that the production from export of aluminum shares at the highest rate of around 50 % to the whole industrial sectors sticking out from the others.

Reportedly, the largest enterprises of the industries are the Tajik Aluminum Plant at the top, following it, the Adrasman Lead-Zinc Enterprises, and Tajik-British joint ventures on gold extraction and processing “Zaravshon” and “Darvaz”.

(2) Hydro-Power Sector

According to an evaluation of a paper⁵, Tajikistan is a leading place in the world in potential electric power resources. A historical development process of power energy in Tajikistan is as follows:

Table R 9.1.10 Historical Development Process of Power Sector in Tajikistan

Name of Station, or Place, or River of:	Constructed on,	Scale, or Installed Capacity	Remarks
	Coming into Power on, or Operation Started on:		
On Varzob River	-	25 MWh	Cascade of 3 hydro-power stations, but did not satisfy needed of growing industry.

⁴ Swiss State Secretariat for Economic Affairs (SECO = Secrétariat d’Etat à l’économie), ed. “*Republic of Tajikistan – Priorities for Sustainable Growth: A Strategy for Agriculture Sector Development in Tajikistan*” p8, May, 2006.WB.

⁵ A web-site named as “tajik-gateway.org” excerpted a publication named as “*Atlas of World Power Engineering – HYDROPOWER and DAMS –*”, 1997.

Kayrakkum Power Station, on Syrdartia River	1956	126 MWh	It brings about a great role for domestic industrial use.
A cascade with 3 stations as Perepadnaya, Golovnaya and Central, on Vakhsh	-	210 MWh	The power could be supplied for a long time in Tajikistan.
Nurek Power Station	1979	2,000 MWh	This power station has counted as one of 30 greatest power stations in the world.
Baypazinskaya Power Station, on Vakhsh River	1980s		By this status, the power supply was still not enough for the needs (shortage: around 600 kWh/year). This shortage has covered by import from Turkmenistan, Uzbekistan and Kyrgistan based on the world energy
Rogun, on Vakhsh River	1980s		
Sangtuda, on Vakhsh River	1980s		
Shurob, on Vakhsh River	1980s		
A Project of Scale-Up of Sangtuda Power Station has started	1989	600 MWh	Not completed yet as of 2006. (Planned)

Source: a web-site named as "tajik-gateway.org"

In 1996, the Sangtuda Power Station has become an open type joint-stock company with Russian capital by the decree of the President of Tajikistan named as "Sangtuda".

And at the present, a new scale-up project has been started for the Rogun Power Station. It's planned installed capacity is to be 3,600 MWh. It is spoken that, when this station comes into power, Tajikistan will become the largest power exporter in the Central Asia and Caucasus Region. The said both 2 projects are led by Russ-Al (Russian Aluminum Authority).

For this purpose, all the domestic cement is forced to use those projects, so the other construction works are influenced greatly.

(3) Oil-Gas Sector

In 1985, the year of the beginning of so called as "Perestroika", 389,000 tons of oil and 309 million m³ of gas were mined in Tajikistan. In 1996, oil mining was reduced less than one tenth as 26,000 tons, and gas mining was also reduced nearly one tenth as 47 million m³. These reductions have started since the beginning of 1990s, the time of ex-USSR has broken down. Generally speaking, Tajikistan has great natural resources in this field. So that, development in this sector may be waited for the future.

(4) Agricultural Sector

Mechanism of Land Management

Prior to discuss on the status of agricultural production together with farmers' activities, it should be made clear a mechanism of the land management in Tajikistan at present.

Since Independence of Tajikistan from USSR on the date of Sep. 9, 1991, the new Government of Tajikistan has started to split the great scale of ex-Sovkhozes and ex-Kolkhozes into small scale farmers' farms so called as "Dehkan Farms" so that the farming management or agricultural management is to be easier for farmers than before. This movement is called as "the Land Reform" or "the Privatization". It implies that the government puts the agricultural management back to farmers as an original position. The word "Dehkan" means the farmers.

In the time of ex-USSR, the central Government of USSR made a production plan, and ordered to achieve the production target to Sovkhozes and Kolkhozes. Sovkhozes and Kolkhozes should have submitted monthly report to the Government of USSR directly or through the Party. And the Government of USSR supervised the production status based on such monthly report.

Tajikistan had been specified as an area for production of cotton by the central Government of USSR. In the Tajikistan territory, Khatlon Oblast is the greatest area of cotton production at

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the time of USSR. The target area, the Hamadoni Rayon (the Hamadoni District) and Farkhor Rayon (the Farkhor District) are leading places for cotton production in the Khatlon Oblast.

The above mentioned privatization of the Land Management is started by the Land Reform Law adopted in 1992, and final revision for that law is adopted in April 2003 called as “Dehkan Farm Law” based on the Presidential Decree No.522 in 1996.

Here, it is noted that a series of the Land Reform activities is only for “Land Management”, and not for “Land Ownership”. The land still belongs to the Government up to the present.

However, nevertheless such drastic reorganization to “Dehkan Farms” from the old system as the ex-Sovkhozes or ex-Kolkhozes has been made, almost of all the farmers are thinking about themselves to work for ex-Sovkhozes or ex-Kolkhozes. And in this case, they do not know yet about what “Dehkan Farms” are.

Heads of the ex-Sovkhozes or ex-Kolkhozes are elected to stay on remained as heads of the new Dehkan Farms, the List of Land Certification, the Map of Farms, and Name List of the Members of the Dehkan Farms in the name of heads of the Dehkan Farms (former heads of ex-Sovkhozes or ex-Kolkhozes). The Members must be received allocated shares, ID card as a Member of the Dehkan Farms according to the regulation.

Each Dehkan Farm receives a production target from the state Government through Oblast authority, Rayon authority and Jamoat authority (local administrative authority) according to the governmental hierarchy of the nation.

On the other hand, local investors contact and negotiate with the Dehkan Farm. In this case, Dehkan Farm proposes to the local investors about production plan which the Dehkan Farm has already received from the local administrative authority.

The local investors should accept such proposals from the Dehkan Farms, and the investors give the Dehkan Farm seeds of cotton according to the proposals, necessary volume of fertilizers, equipment and machines needed for the cultivating and planting the cotton seeds, etc at the beginning of the year (usually February in each year) as shown in the above figures in the box.

As mentioned above, Dehkan Farms are reorganized from ex-Sovkhozes or ex-Kolkhozes. On the other hand, there are some newly established Dehkan Farms too. Those newly established Dehkan Farms are formed by the farmers’ initiative. The Dehkan Farm Law issued in 2003 encourages such kind farmers’ initiatives. First of all, the farmers may apply to take land management rights to the local administrative authority. The local administrative authority inspects such application from the farmers. When the application is passed such inspection, the Dehkan Farm is approved, and it can start its’ works as the Dehkan Farm. But, in Hamadoni Rayon, there are only 2 units of such newly established Dehkan Farms until the year 2006.

All the Dehkan Farms can plant every agricultural crop, but they should follow the Governmental order that reached to them through local administrative authorities. Therefore, they are mainly planting cotton (around 80 % or more).

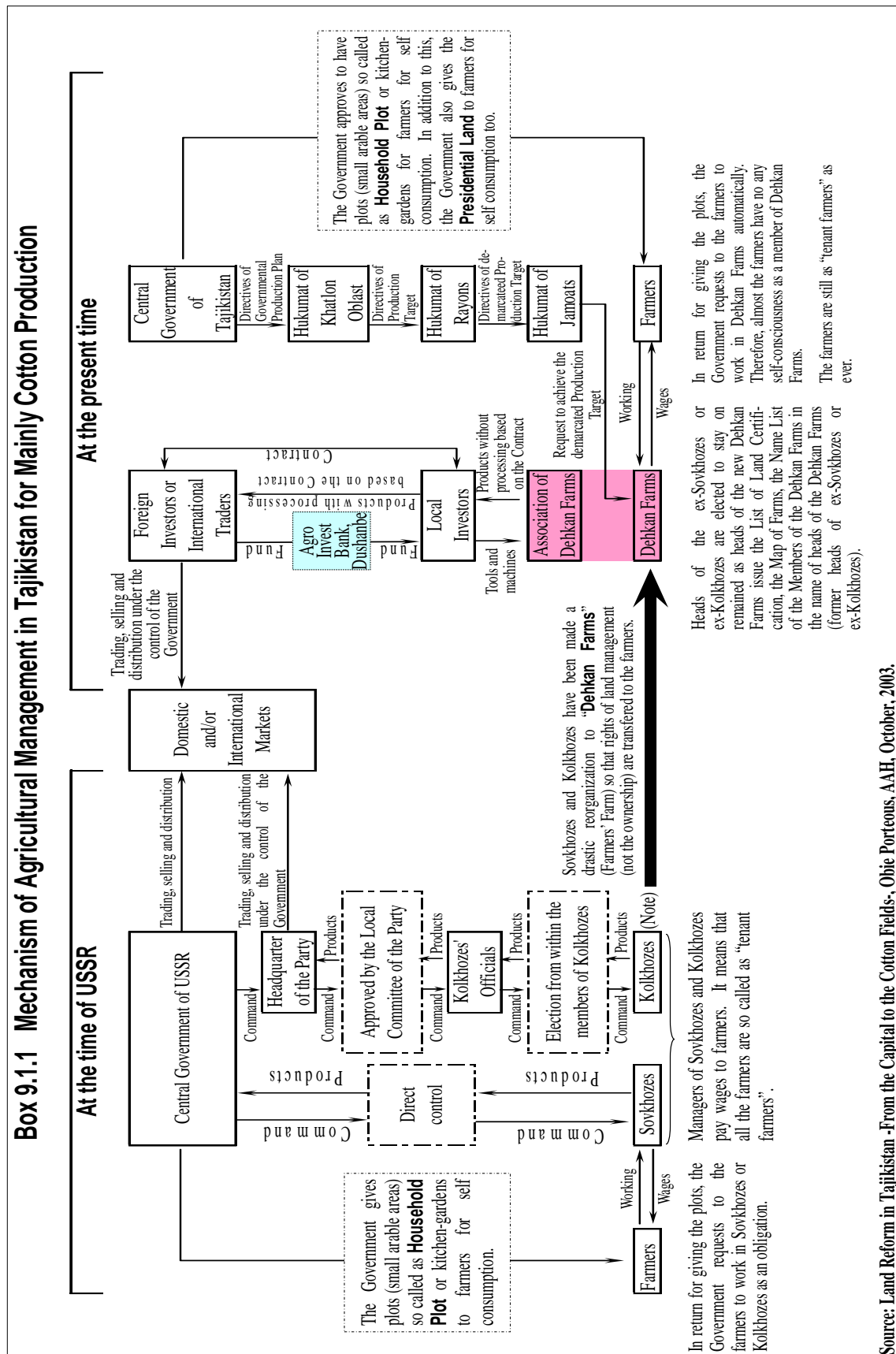
A bar-chart showing in the box on the next page explains the above mentioned mechanism.

Production of Cotton and Agricultural Activities

Cotton production is one of strategic agricultural activities of Tajikistan. Therefore, the Government of Tajikistan controls the production of cotton as discussed above. Accordingly, most of the agricultural fields are used for cotton production. From this viewpoint, cotton production status is mainly discussed hereunder.

The agricultural fields that are used for cotton are also used for the other agricultural crops as vegetables after using for cotton in several years because of land fertility. In this case, another agricultural field that has been used for other crops becomes to use for cotton for compensation to keep the same production volume of cotton.

Total area of the territory of the nation of Tajikistan is 14,255.4 ha. Table R9.1.11 hereunder shows a summary of land use status by rights of land-use.



Source: Land Reform in Tajikistan - From the Capital to the Cotton Fields-, Obie Porteous, AAH, October, 2003.

Table R 9.1.11 Land Use Status by Rights of Land-Use

(1,000 ha)

Year	Area of Disposable Land for Agricultural Activities in Total	Consisting of:							
		Total	Agricultural Enterprises				Dehkan Farms	Agricultural Area for Fruits and Vegetable	Household Plots
			Kolkhozes and Sovkhozes	Other State Enterprises	Inter-Economic Enterprises	Other Agricultural enterprises			
2000	9,179.50	5,074.10	1,811.80	2,233.40	154.10	874.80	4,104.60	0.90	185.40
2001	8,389.00	4,579.20	1,475.60	2,246.20	154.00	703.40	3,808.90	0.90	191.80
2002	8,335.60	4,342.80	1,129.20	2,002.40	149.40	1,061.80	3,991.90	0.90	201.60
2003	7,801.40	3,556.60	845.30	1,656.70	123.90	930.70	4,233.70	1.10	206.30
2004	7,784.40	3,097.90	841.20	1,445.40	109.00	702.30	3,685.70	0.80	216.60
2005	7,578.00	2,747.50	653.60	1,311.10	111.20	671.60	4,829.40	1.10	223.50

Sources: Agricultural Statistics 2006, State Statistic Committee (SSC).

(Note) Since 1991, the total area of the territory of the nation of Tajikistan is **14,255.40** thousand ha in total.

As indicated in the above table, there are 2 type of land use as (1) the area of disposable land for agricultural activities, and (2) the household plots.

According to the policy of the nation of Tajikistan, the area used by Kolkhozes and Sovkhozes are gradually decreased year by year from 1,812 thousand ha in 2000 to 654 thousand ha in 2005 as shown in the above table. However, the areas used by the other Land-Use Right holders are not increased, moreover are decreased in some areas.

The area used by "Dehkan Farms" are fluctuated during last 6 years, but finally it has been increased from 4,105 thousand ha in 2000, to 4,829 thousand ha in 2005.

The area used as household plots are increased year by year. Population growth may be reflected to this land use.

The area for disposable land for agricultural activities does not mean the area under agricultural use. Following table shows a summary of the land under agricultural use among the disposable land:

Table R 9.1.12 Area under Agricultural Use by Rights of Land-Use

(1,000 ha)

Year	Area under Agri- cultural Use in Total	Consisting of:						House- hold Plots
		Agricultural Enterprises						
		Total	Kolkhozes and Sovkhozes	Other State Enter- prises	Inter- Economi- c Enter- prises	Other Agri- cultural enter- prises	Dehkan Farms	
Area of Under-Agricultural-Use								
2000	4,126.50	2,730.70	970.40	1,194.10	97.10	469.10	1,395.50	185.40
2001	4,054.10	2,472.00	748.20	1,231.30	97.20	395.30	1,581.90	191.80
2002	4,066.20	2,377.80	586.70	1,123.60	93.80	573.70	1,688.10	201.60
2003	3,916.90	1,942.80	444.00	920.50	84.90	493.40	1,973.90	206.30
2004	3,921.00	1,669.70	421.70	816.60	78.40	353.00	2,251.10	216.60
2005	3,864.60	1,484.00	341.00	722.10	79.80	341.10	2,380.60	223.50
Arable Land of the Under-Agricultural-Use								
2000	730.10	500.40	252.20	131.30	3.80	113.10	227.70	138.70
2001	731.10	438.00	196.50	131.80	3.70	106.00	293.10	142.10
2002	731.20	415.50	160.50	109.20	2.90	142.90	315.80	147.40
2003	713.90	321.30	84.10	72.50	4.40	160.30	392.60	149.70
2004	718.00	252.10	98.80	63.00	2.50	87.80	465.90	153.10
2005	709.00	200.90	75.90	47.60	2.60	74.80	508.10	155.90

Sources: Agricultural Statistics 2006, State Statistic Committee (SSC).

As indicated in the above table, the area under agricultural use is almost half of the total disposable land, and the area of arable land is less than one fifth of the area under-agricultural-use. The area for fruit trees and vegetables are negligible small as shown in the above Table R 9.1.11, so that it is discussed on cotton production hereunder.

Under those land use status mentioned above, cotton has been produced. Following table shows a summary of cotton production status.

Table R 9.1.13 Production Status of Cotton in Tajikistan

Description	2000	2001	2002	2003	2004	2005
Cultivated Area (ha)						
GBAO	0	0	32	50	85	0
Sughd Oblast	69,098	75,267	80,834	85,508	88,176	86,392
Khatlon Oblast	150,287	160,505	165,335	173,527	178,851	177,036
DRS	19,233	21,599	22,996	25,282	26,489	25,227
Total in the Nation	238,618	257,371	269,197	284,367	293,601	288,655
Production of Raw Cotton in Total (ton)						
GBAO	0	0	29	32	106	0
Sughd Oblast	120,958	145,347	154,872	148,466	159,424	155,526
Khatlon Oblast	177,950	255,092	305,725	334,031	334,079	240,884
DRS	36,519	52,296	54,852	54,829	63,157	51,508
Total in the Nation	335,427	452,735	515,478	537,358	556,766	447,918
Unit Productivity (tons/ha)						
GBAO	n.a.	n.a.	0.91	0.64	1.25	n.a.
Sughd Oblast	1.75	1.93	1.92	1.74	1.81	1.80
Khatlon Oblast	1.18	1.59	1.85	1.92	1.87	1.36
DRS	1.90	2.42	2.39	2.17	2.38	2.04
Total in the Nation	1.41	1.76	1.91	1.89	1.90	1.55

Source: Agricultural Statistics 2006, State Statistic Committee (SSC), Tajikistan.

As indicated in the above table, total area for cultivation of cotton is 289 thousand ha in total in the nation. Among them, share rate of the field for cotton production in Khatlon Oblast is 61.33 % in 2005 and at the top ranking in the cotton production field. The second is Sughd Oblast, and it shares at 29.93 %. From this viewpoint too, it may be clear that the Khatlon Oblast is the strategic region for cotton production.

Production of raw cotton in total is around 480,000 tons in total in the nation in 2005. But, this

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volume is rather low in each region comparing that in 2001 through 2004. This means that damages caused by natural disaster as floods of this year are not only in Khatlon, but also the regions.

The table shows that the highest production is 2004. The production volume in Khatlon shares at just 60 % to the total production volume in the nation in 2004. In the same time, the production volume in Sughd Oblast shares at 28.63 % to the total production volume in the nation.

Unit yield of cotton per ha is fluctuated during 2000 through 2005, but it may be estimated at around 1.9 tons per ha in normal year as 2002, 2003 and 2004. This unit yield may be depending upon climate condition. But, in 2005, it is down greatly as 1.55 tons per ha. It may say that caused by the flood occurred in that year.

9.1.8 Salary and Wages

According to the statistics⁶, the average salaries and wages are as shown in the following table.

Table R 9.1.14 Average Salaries and Wages in Tajikistan

	(TJS/month per worker)					
Year	1999	2000	2001	2002	2003	2004
National Average	11.61	15.57	23.50	32.55	44.61	61.81
Average in Dushanbe	24.87	31.00	45.07	61.83	85.76	121.63
Average in Hamadoni	7.25	8.26	14.89	21.21	32.28	38.60

Source: Regions of the Republic of Tajikistan, 2003, 2004 and 2005, Committee of Statistics of the Republic of Tajikistan.

Following figure is illustrated one of the above average salaries and wages in Tajikistan.

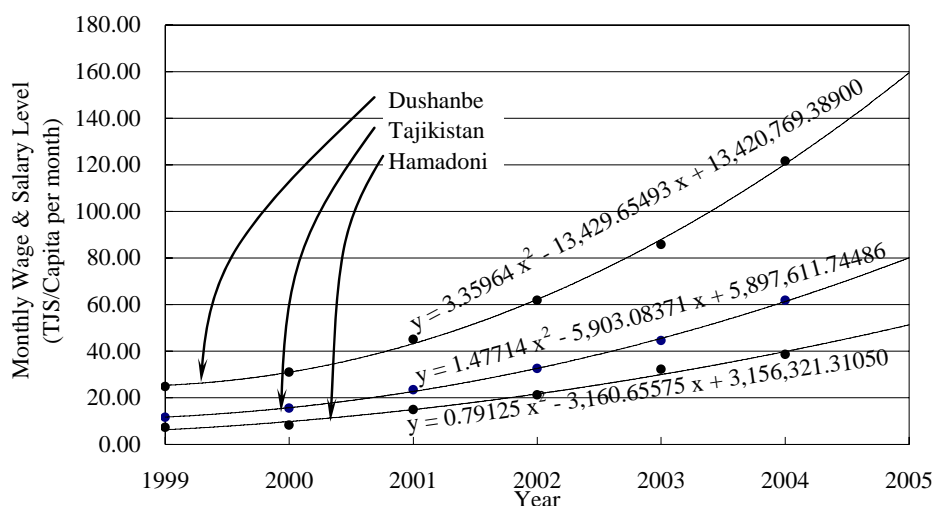
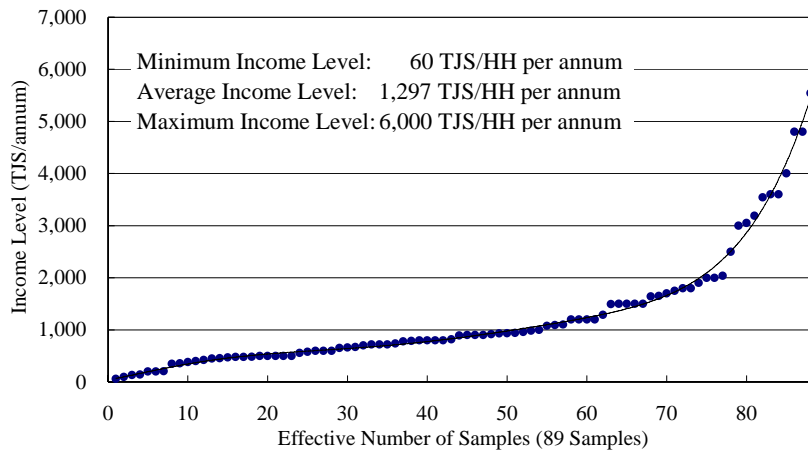


Fig. R 9.1.5 Past Trend of Average Monthly Wages and Salaries in the Nation of Tajikistan, the Capital City of Dushanbe and Hamadoni Rayon

9.1.9 Family Status and Family Economy

According to the Resident Consciousness Survey, the income level of household is as indicated below.

⁶ “Regions of the Republic of Tajikistan”, 2003, 2004 and 2004, Committee of the Statistics of the Republic of Tajikistan.



Source: Survey on Resident Consciousness in Flood, made by JICA Study Team, 2006.

Fig. R 9.1.6 Average Household Income

As mentioned in previous sub-clause of 9.1.2, the average family size in Hamadoni Rayon is 9.01 persons/HH and average income level of each HH is 1,297 TJS/annum both at the time of 2005. And, based on the “Past Trend of Average Monthly Wages and Salaries in Hamadoni Rayon” as indicated above figure of R.9.1.5, average salaries and wages level as of 2005 can be estimated at 51.31 TJS/month per worker ($= 0.79125 * 2005^2 - 3,160.65575 * 2005 + 3,156,321.31050$).

Therefore, average workable persons per HH can be estimated at 2.11 persons/HH ($= 1,297 \text{ TJS/year} \div 12 \text{ months} \div 51.31 \text{ TJS/month per worker}$) by means of income proportion. Here, the average monthly income level of HH can be estimated at 108.08 TJS/HH per month ($= 1,297 \text{ TJS/HH per year} \div 12 \text{ months}$).

Following table shows a summary of expenditures per one member of HH in the whole nation. The term “one member” may mean “a workable member” of the family because of survey methodology.

Anyway, the share rate of expenditure for foods is 72 % or more as of 2005 that has been decreased from 87 % in 2000 as shown in the table, and life standard has slightly been improved during last 6 years. Nevertheless, share rate of expenditure of 72 % for food is still high rate comparing with other similar developing countries reflecting economical status of household. Namely, prices of daily articles, especially prices for foods are high comparing with income level of household. For example, it is 55 % in Albania as of 2000.

Table R 9.1.15 Disbursement of Expenditures per One Member of Household

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(TJS/one per one member per HH per month)

Item of Expenditure							Share Rate of
	2000	2001	2002	2003	2004	2005	Each Expenditure to the Total Expenditures as of 2005
Foods	14.18	18.90	22.10	23.67	28.61	35.20	72.34%
Non-Foods	1.68	2.39	3.60	5.14	7.00	9.01	18.52%
Clothes, Shoes, Underwear, Fabrics	0.93	1.26	1.90	2.63	3.15	4.02	8.26%
Construction Materials	0.05	0.05	0.13	0.25	0.81	1.16	2.38%
Fuel	0.03	0.08	0.06	0.11	0.12	0.17	0.35%
Goods and Accessories on Housekeeping, Furniture	0.14	0.23	0.43	0.57	0.74	1.05	2.16%
Medicines	0.10	0.14	0.21	0.31	0.40	0.52	1.07%
Medical Goods and Items of Personal Hygiene	0.01	0.01	0.01	0.01	0.02	0.02	0.04%
Smokables	0.07	0.07	0.11	0.14	0.16	0.18	0.37%
Fancy & Other Goods	0.35	0.55	0.75	1.12	1.60	1.89	3.88%
Civil Services	0.49	1.14	1.62	2.58	3.32	4.45	9.15%
Personal Services	0.05	0.11	0.15	0.18	0.22	0.31	0.64%
Public Facilities	0.16	0.32	0.43	0.76	1.03	1.29	2.65%
Services of Institution of Culture	0.01	0.01	0.01	0.01	0.06	0.10	0.21%
Communication Services	0.01	0.01	0.02	0.03	0.03	0.09	0.18%
Services of Passenger Traffic	0.22	0.55	0.77	1.28	1.62	2.12	4.36%
Education Service	0.03	0.07	0.13	0.15	0.22	0.26	0.53%
Other Services	0.01	0.07	0.11	0.17	0.14	0.28	0.58%
Total Expenditures	16.35	22.43	27.32	31.39	38.93	48.66	100.00%

Source: The National Bank of Tajikistan (NBT).

According to a result of the said Resident Consciousness Survey, they have 0.15 ha of household plot in average as indicated in the following figure.

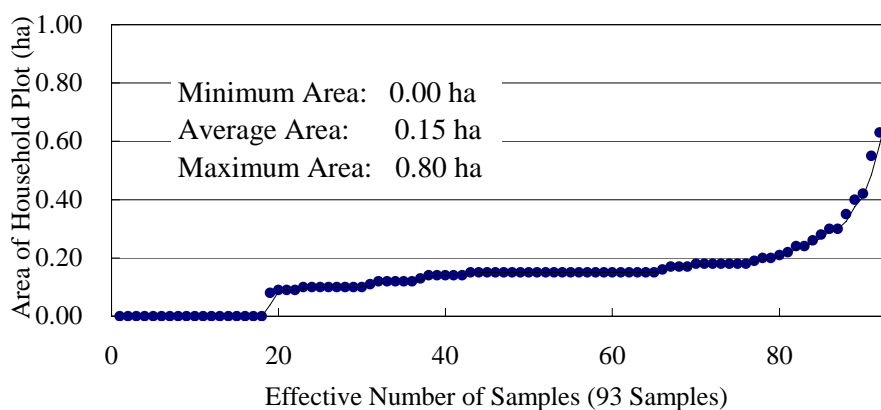


Fig. R 9.1.7 Average Household Plot

And, the average floor area of their houses is estimated at 90 m² based on the other result of the said Resident Consciousness Survey as shown in the following figure.

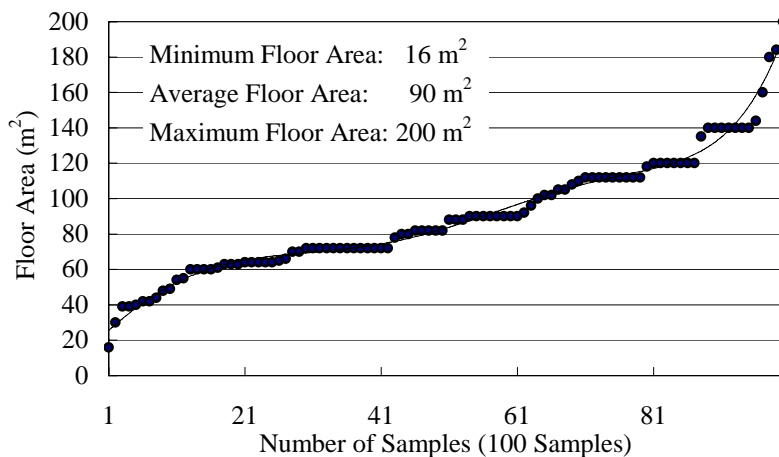


Fig. R 9.1.8 Average Floor Area of Houses of Residents

From those data as indicated in Fig.R9.1.7 and R9.1.8, they have 0.15 ha (= 1,490 m²) of household plot, and houses with 90 m² of floor area.

9.1.10 Prices

(1) Consumer Price Indices

According to a historical trend of consumer price indices (CPIs) are fluctuated greatly. Especially, just after the substantially finishing the Tajikistan Civil War in 1999, CPIs in 2000 were actually increased by 60 % against previous year.

However, since 2000, consumer price indices (CPI) have been constant with a rate of around 9 % in average. Details are shown in Annex 9.1.2.

Table R 9.1.16 Consumer Price Index (CPI) in the Nation

Description	2000	2001	2002	2003	2004	2005	2006	(2000 = 100)
								Annual Increasing Ratio
Overall CPI, o/w:	100.00	112.48	128.79	146.38	154.61	165.26	186.23	9.29%
All Goods, o/w:	100.00	114.39	131.37	144.14	151.32	161.73	181.25	8.87%
Foodstuff, Including Alcohol Drinks	100.00	117.87	138.11	151.90	158.80	172.06	196.49	10.13%
Non-Food	100.00	99.21	105.53	114.28	121.41	124.73	131.36	3.97%
Services	100.00	86.06	94.77	145.18	161.58	176.43	210.23	11.20%

Source: The National Bank of Tajikistan (NBT).

(2) Producer Price Indices

Producer price indices (PPIs) are rather higher than CPIs. It means that net gains of the producers have been gradually decreased year by year. The annual average PPI in the nation of Tajikistan is shown as around 15 %

Following table show a summary of producer price indices.

Table R 9.1.17 Producer Price Indices (PPI) in the Nation

Description	2000	2001	2002	2003	2004	2005	2006	Annual
								Increasing Ratio
PPI - total, o/w:	134.04	141.30	168.39	192.81	224.15	236.68	365.23	15.40%
Electric energy	130.43	130.43	360.70	407.79	407.79	407.77	407.75	17.68%
Fuel	149.37	184.80	217.90	302.10	358.80	469.73	750.46	25.94%
Nonferrous metallurgy	146.02	143.56	174.41	199.39	247.70	260.73	521.13	19.93%
Chemical	114.64	123.24	150.84	185.53	148.60	160.89	234.16	10.74%
Machine building	132.12	152.70	167.95	216.58	237.22	266.92	297.59	12.30%
Construction materials	109.09	108.33	152.13	187.84	198.50	225.79	248.87	12.50%
Light industry	123.73	116.31	124.31	138.57	183.59	199.68	208.18	7.72%
Food	148.06	220.04	216.89	258.59	269.92	295.62	345.61	12.87%
Flour grinding	106.77	115.85	120.63	128.44	128.95	127.77	130.50	2.91%

(3) Exchange Rate

According to the National Bank of Tajikistan (NBT)⁷, the official exchange rates of the local currency of Tajikistan Somoni (TJS) against US Dollar have been fluctuated as follows:

Table R 9.1.18 Trend of Exchange Rates of Tajikistan Somoni (TJS) against US Dollar

Month	(TJS/US\$ at the end of each month)							
	2000	2001	2002	2003	2004	2005	2006	2007
January	1.5500	2.2205	2.5500	3.0647	2.9050	3.0400	3.2086	3.4386
February	1.5920	2.2821	2.6500	3.0680	2.9000	3.0421	3.2127	
March	1.6310	2.3033	2.6800	3.0681	2.9077	3.0431	3.2134	
April	1.6310	2.3152	2.6808	3.0900	2.9120	3.0500	3.2139	
May	1.7000	2.3223	2.7021	3.0900	2.9241	3.0719	3.2219	
June	1.7000	2.3223	2.7041	3.0900	2.9813	3.1160	3.2810	
July	1.9000	2.3307	2.7126	3.0908	3.0072	3.1600	3.3537	
August	1.9580	2.3402	2.8454	3.0900	3.0178	3.1876	3.3817	
September	2.0500	2.3463	2.9249	3.0900	3.0262	3.1802	3.3844	
October	2.2000	2.3522	2.9527	3.0544	3.0271	3.1858	3.2774	
November	2.2000	2.3800	2.9882	2.9610	3.0317	3.1950	3.3965	
December	2.2000	2.3588	3.0000	2.9565	3.0370	3.1993	3.4265	

Remarks: The other exchange rates for reference

Against Japanese Yen 10.00: **0.2825**
Against EURO, €1.00: **4.4430**

According to the Official Home-Page of NBT on the web-site, US\$ 1.00 is equal to 3.4386 TJS, Japanese Yen 10.00 is equal to 0.2825 TJS and €1.00 is equal to 4.4430 TJS as of the end of January, 2007. And, US\$ 1.00 is equal to Japanese Yen 121.72 estimated by using the said exchange rates. So, these currency conversion rates are to be used in this report until otherwise stated.

9.2 ECONOMIC ANALYSIS

9.2.1 Economic Evaluation of Project

In general, a project will be evaluated taking engineering, economic and/or financial aspects into consideration. The engineering aspects are studied and form a part of the technical reliability of the project from the viewpoint of construction, operation and maintenance.

Economic evaluation is to be made by the following steps in this kind of project. In this case, the steps from the viewpoint of economic evaluation only are discussed hereunder.

- i) To value of each damage item.
- ii) To estimated unit value per unit area (amount/ha).
- iii) To estimate most likely damages of the adopted flood.
- iv) To estimate annual average flood damages by means of probability analysis.
- v) To estimate the benefit due to the project under the consideration of “With-” and “Without-Project” concept.
- vi) To compare the benefit with the cost, and evaluate the project feasibility by means of some indices as the economic internal rate of return (EIRR), the net present value (B – C), and B/C Ratio.

(1) Methodology of Economic Evaluation

The EIRR is to be calculated using a cash flow of economic cost and economic benefit during the project life. This EIRR is defined by the following formula:

⁷ The National Bank of Tajikistan (NBT) has its own home-page on the web site to publicize statistical data on the state of Tajikistan, and the several exchange rates are including in it too.

$$\sum_{t=1}^{t=T} \frac{C_t}{(1 + R_e)^t} = \sum_{t=1}^{t=T} \frac{B_t}{(1 + R_e)^t}$$

Where, $T =$ the last year of the project life,

$C_t =$ an annual economic cost flow of the project under study in year t ,

$B_t =$ an annual benefit flow derived from the project in year t , and

$R_e =$ the Economic Internal Rate of Return (EIRR) (a discount rate to be used for costs resulted at the same amount of the benefits in terms of the present value).

When the resulted EIRR is the same rate with or higher than the discount rate applied for calculation of present value of both the benefit and cost, the project has a feasibility to execute.

Generally, the economic cost of a project is identified as opportunity cost of capital. In this case, if goods and services would be invested in the project under study, they could no longer be utilized for other projects. This implies that the benefits of the other projects could have been created would be sacrificed. These sacrificed benefits of the other projects are called opportunity cost of the project. The applied discount rate is generally considered as the same rate of the said opportunity cost of capital. Therefore, a resulted EIRR is to be higher than the applied discount rate⁸ meaning a rate of opportunity cost of capital.

The NPV is expressed as “B-C” and defined by the following formula:

$$NPV = B - C = \sum_{t=1}^{t=T} \frac{B_t}{(1 + R_e)^t} - \sum_{t=1}^{t=T} \frac{C_t}{(1 + R_e)^t}$$

It means that, if the present value of the benefit subtracting by the present value of cost would become positive, then the project being under study will have a reliability to execute.

The B/C Ratio is defined by the following formula:

$$B / C = \frac{\sum_{t=1}^{t=T} \frac{B_t}{(1 + R_e)^t}}{\sum_{t=1}^{t=T} \frac{C_t}{(1 + R_e)^t}}$$

It means that, if the rate of the present value of the benefit dividing by the present value of the cost would become more than “1.00”, then the project being under study will have a reliability to execute.

⁸ The World Bank says that “the discount rate reflects the rate of fall of the value of consumption over time. (William A. Ward and Barry J. Deren, Ed. “*The Economics of Project Analysis -A Practitioner's Guide-*” IBRD Technical Paper).

Regarding the EIRR, the Asian Development Bank (the ADB) says that “the projects have viability when the resulted EIRR exceeds the Opportunity Cost of Capital (the OCC). In almost the developing countries, the most likely EIRR is ranging from 8 % to 12 %. Therefore, there will be no any issues if the resulted EIRR exceeds the 12 % to execute the projects, but if the resulted EIRR is less than the rate of 12 %, it is required some specified explanation concerning the benefits that could not be converted into monetary terms.” (“*Occasional Papers -Economic and Financial Appraisal of Bank Assisted Project*” ADB Appraisal Paper No.11, January 1978).

Also regarding the EIRR, the World Bank says that “if the OCC (in other words, “the EIRR”) is resulted at 5 % except the non-commercial projects, it is too low. But if it is resulted at 20 %, it is too much. Usually, the World Bank adopts the rate of 10 %.” (Warren C. Baum and Stokes M. Tolubert, Ed. “*Investing in Development -Lessons of World Bank Experiences-*” IBRD, June 1985).

Anyway, unless the amount of cost and benefit are not changed in the same project, always a certain EIRR is to be resulted even if any discount rate is applied. In other words, the EIRR has a meaning to avoid arbitrariness of the B/C ratio.

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The project life is assumed at 50 years after completion of the construction works for the Project. Cash flow of the economic cost and economic benefit should be made from the first year of the construction works to the end of the project life.

In this case, annual operation and maintenance cost (O&M Cost) should be taken into account. And, some amount of replacement cost, if any, should also be taken into consideration since some parts of the initial works for the facilities as metal works may not be durable during the project life.

(2) Estimation of Flood Damages

1) Damages to Houses and Household Properties

Damages to House

According a result of Residents Consciousness Survey made by JICA Study Team on May 2006, average floor area of house of the residents in Hamadoni is 90 m² as shown in Fig 9.1.8 in sub clause 9.1.9 above.

Flood affected houses consist of 3 types as (1) totally destroyed, (2) partially destroyed, and (3) inundated houses. Caused by 2005-flood, 136 houses have been totally destroyed, 130 houses have been partially destroyed, and 300 houses have been inundated according to the flood record reported by MES.

Unit construction cost per house is assumed at US\$ 9,000 based on information from interview survey made by JICA Study Team on September, 2006. But, this cost may be for constructing new houses or renewal of their houses. Almost of their houses are old ones with around 40 years to 50 years after construction. Residual value of the houses is assumed at 20 % at the time of flood occurred.

In the case of totally destroyed houses, full cost will be needed for renewal of the houses. It means that this cost can be considered as damages. And, in the other cases as partially destroyed houses and inundated houses, the damage rates are assumed as 50 % and 20 % based on the said interview survey.

Totally Destroyed House



Partially Destroyed House



Fig. R 9.2.1 Houses Destroyed Caused by 2005-Flood

On the other hand, inundated area or flooded area of build-up area is calculated by means of GIS based on a Satellite Photos as 55.95 ha. This inundated build-up area consists of inundated housing area (inundated floor area) and inundated household plot (kitchen garden) estimated at 3.19 ha and 52.76 ha respectively by means of proportion of the said unit floor area per house and unit household plot (kitchen garden) per house.

Based on the above information and data, unit amount of damages per ha and the amount of damages to houses caused by 2005-Flood can be estimated.

Damages to Household Properties

The household properties consist of 2 categories as (1) in-house movables, and (2) agricultural tools and equipments keeping outside of houses. Numbers of the in-house movables they are having have gotten in the said Residents Consciousness survey. And, unit prices of them are gotten by means of market survey. Table R 9.2.1 hereunder shows a calculation process, and the average amount of properties in case of in-house movable is estimated as 7,759 TJS/HH.

About the agricultural tools and equipments they are having, the data has been gotten by the interview survey on January 2007. Prices of them are surveyed by the market survey too. Table R 9.2.2 shows a summary of the survey. And, the average amount of properties in case of agricultural tools and equipment is calculated as 2,640 TJS/HH.

In the case of calculation of the amount of properties in these 2 tables, residual values of vehicles (cars) and/or such agricultural equipments as flour mills, oil press machines, threshing machines are assumed at 10 % against the price for purchasing them at present, and those for other properties are also assumed at 50 % for purchasing them at present too.

Table R 9.2.1 Calculation of Amount of In-House Movables per Household

In-House Movables	Number of Movables in Total											Remark
	Tele- vision	Radio	Refrigerator	Kurpacha (Mattress and Blanket)	Furnish- ing (Closet)	Cooking Stove (Pechika for cooking)	Car (including Trackter)	Sewing Machine	Tape Recorder	Motor Cycle	By- cycle	
	Number of Samples Answered for Questionnaire of Residents Consciousness Survey											
	92	50	12	500	25	100	39	55	1	#REF!	30	Average Value of Household's Prtoperties per HH (TJS/HH)
Units/HH	0.92	0.50	0.12	5.00	0.25	1.00	0.39	0.55	0.01	0.05	0.30	
Price/unit (TJS)	300	20	350	40	300	150	17,000	340	150	1,700	340	
Value per HH (TJS)	276	10	42	200	75	150	6,630	187	2	85	102	

Source: Residents Consciousness Survey, made by JICA Study Team, May 2006.

Remarks 1: Rate of residual value of car and other equipments. 10%

Remarks 2: Rate of residual value of other movables and agricultural tools. 50%

Table R 9.2.2 Calculation of Amount of Agricultural Tools and Equipments per Household

Kind of Agricultural Tools/Equipment, the Household has	Number of Agricultural Tools/Equipment in Total							
	Small Hoe	Spade	Shovel	Bar	Pickax	Scythe	Big Scythe	
Units/HH	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Price/unit (TJS)	7	8	7	18	20	5	28	
Value per HH (TJS)	7	8	7	18	20	5	28	

Kind of Agricultural Tools/Equipment, the Household has	Number of Agricultural Tools/Equipment in Total						
	Axe	Hoe	Two- Hundl- ed Saw	Saw	Hammer	Pail	Scissors
Units/HH	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Price/unit (TJS)	30	10	35	7	6	10	15
Value per HH (TJS)	30	10	35	7	6	10	15

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Kind of Agricultural Tools/Equipment, the Household has	Number of Agricultural Tools/Equipment in Total						
	Fork	Hook	Flour Mill	Oil Press Machine	Threshing Machine	Pliers	Mesh
Units/HH	1.00	1.00	0.10	0.10	0.10	1.00	1.00
Price/unit (TJS)	14	12	7,621	13,548	2,032	4	11
Value per HH (TJS)	14	12	762	1,355	203	4	11

Kind of Agricultural Tools/Equipment, the Household has	Number		Average Value of Agricultural Tools/Equipment per HH (TJS/HH)
	Grain Drying Mats	Grain Wash Basin	
	Units/HH	1.00	
Price/unit (TJS)	33	40	
Value per HH (TJS)	33	40	384

Source: Market survey, made by JICA Study Team, January 2007.

Remarks 1: Rate of residual value of car and other equipments. 10%

Remarks 2: Rate of residual value of other movables and agricultural tools. 50%

Summary of Damages to Houses and Household Properties

Table R 9.2.3 shows a summary of estimated damages to houses and household properties. As indicated in the table, the unit amounts of damages to (1) totally destroyed houses, (2) partially destroyed houses and (3) inundated houses each per ha are the sum of TJS 802 thousand, TJS 490 thousand, and 303 thousand respectively.

In this case, rates of damages are assumed 100 % for totally destroyed houses, 50 % for partially destroyed and 20 % for the inundated houses based on information from domestic people by the interview survey made by JICA Study Team on September, 2006.

Table R 9.2.3 Summary of Damages to Houses and Household Properties

Destruction Status	Number of Houses Affected	Average Floor Area per House (m ²)	Unit Construction Cost per House				Household Properties		Amount of Unit Damages per HH (TJS/HH)	Damages per Unit Area (TJS/ha)	Damaged Area in Total Caused by 2005-Flood (TJS)
			US\$/house	Exchange Rate** (TJS/US\$)	Destructive Rate	TJS/house	In House Movables	Agricultural Tools			
Totally Destroyed*	136	90	9,000	3.12	100%	28,103	1,227	384	7,232	802,147	615,212
Partially Destroyed*	130	- ditto -	- ditto -	- ditto -	50%	14,052	1,227	384	4,422	490,443	359,554
Inundated (0.5 - 1.0)	300	- ditto -	- ditto -	- ditto -	20%	5,621	1,227	384	2,736	303,420	513,331
Total Number of Houses Affected	566									Total (TJS) 1,488,097	
										(In US\$)**	476,559

Source: *MES.

(Note) **Exchange rate as of 2005.

Remark 1: Damaged Floor Area in Total: 3.19 ha based on GIS.

Remark 2: Rate of Residual Value of House: 20% (assumed)

Damages to houses and household properties caused by 2005-Flood are estimated at TJS 1,488 thousand (equivalent to US\$: US\$ 477 thousand at exchange rate as of the end of 2005).

2) Damages to Household Plot

As discussed in the above sub-clause 9.1.9, they have household plots (kitchen garden) of 0.15 ha (1,490 m²) in average for their self-consumption. They are planting their mainly vegetables twice a year in their household plots, namely (1) spring crops and (2) fall crops.

The spring crops are usually planted during from the end of February to the middle of March, and harvested them during from the latter half of June to the first half of July. This harvesting

time is the time of flooding season.

Therefore, if the flood occurs in this time, their spring crops would be damaged totally. Following table shows a summary of calculation process of damages to these spring crops. In this table, the farm gate prices of the crops are assumed at 50 % of their market prices based on a result of hearing from merchants.

Table R 9.2.4 Estimation of Damages to Vegetables of Spring Crops in Household Plot

Household Crops	Kind and Volume of Vegetables in Household Plot					
	Tomato	Potato	Eggplant	Cucumber	Green Pepper	Red Pepper
Production per HH Plot (kg)	100	50	10	60	15	10
Price in Markt (TJS/kg)	1.50	1.15	0.50	1.00	1.00	1.00
Farm Gate Price (TJS/kg) (50%)	0.75	0.58	0.25	0.50	0.50	0.50
Value of Vegetable in Total (TJS)	75.00	28.75	2.50	30.00	7.50	5.00

Household Crops	Kind and Volume of Vegetables in Household Plot					Total
	Onion	Carrot	Cabbage	Green Hot Peppers	Red Hot Peppers	
Production per HH Plot (kg)	15	10	10	5	5	
Price in Markt (TJS/kg)	0.70	0.80	0.80	3.00	2.00	
Farm Gate Price (TJS/kg) (50%)	0.35	0.40	0.40	1.50	1.00	
Value of Vegetable in Total (TJS)	5.25	4.00	4.00	7.50	5.00	174.50

Source: Interview Survey, made by JICA Study Team, January 2007.

Remarks:

Inundated HH Plot Area in Total: 52.76 ha
 Average HH Plot Area per Household (ha): 0.15 ha/HH
 Amount of Unit Damages: 1,171 TJS/ha
 Damages in Total Caused by 2005-Flood: **61,777 TJS**

(Note) Usually, they are planting twice a year, and harvesting also twice a year. First planting is to be made early spring as the end of February to March, and they harvest the crops in June and July. Therefore, if the floods occurred in June and/or July, the crops are totally damaged. The above production status is for one time cultivation for spring season.

The unit amount of damages to the vegetables per household plot is estimated at 174.50 TJS/HH. It means that the unit damages per unit household plot is 1,171 TJS/ha (= 174.50 TJS / 0.1490 ha).

As mentioned above item 1) in this sub-clause, the inundated household plot area is estimated at 52.76 ha in total caused by 2005-Flood.

Accordingly, the amount damages to the damages to vegetables of spring crops caused by 2005-Flood can be calculated at 61,777 TJS in total (= 1,171 TJS * 52.76 ha).

3) Damages to Cotton

As discussing previously, main agricultural crops are the cotton. It means the main flood damages are to the cotton field in the agricultural sector. For estimation of flood damages to cotton, a cropping pattern of cotton should be made clear first of all.

Cropping Pattern of Cotton

According to the information from Dehkan Farms in Hamadoni District and several farmers working there, the most likely cropping pattern of cotton is as shown in the following figure.

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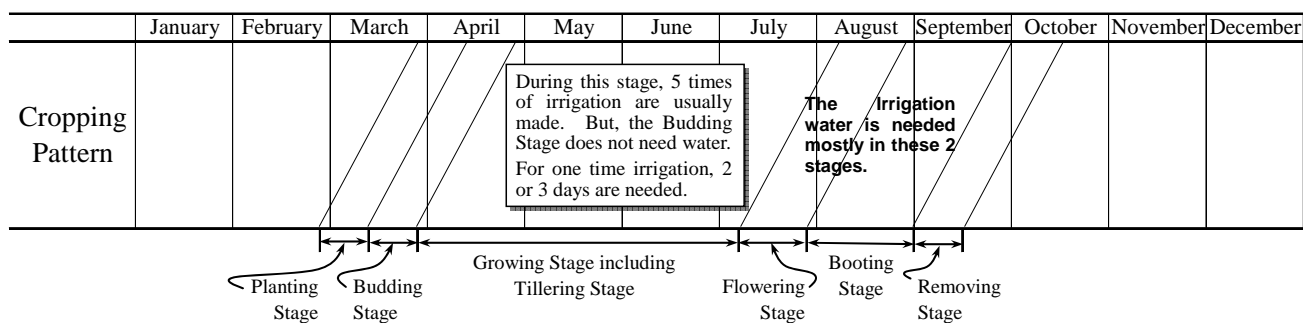


Fig. R 9.2.2 Cropping Pattern of Cotton

Namely,

- (i) By the end of February, Dehkan Farms receive the Cotton Seeds from the Investors.
- (ii) From the end of February to the end of March, the Farmers plant seeds on the fields.
- (iii) Around 10 days to 15 days after the planting, the Budding Stage starts.
- (iv) When the cotton shoots have become around 15 cm to 20 cm, the Growing Stage starts. The Growing Stage continues during around 3 months, and the irrigation water needed around 5 times during this period. Practical times of irrigation are depending upon the growing status of the cotton shoots.
- (v) From the end of June to the end of August depending upon the planting time, the Flowering Stage starts. This stage together with the next Booting Stage needs the irrigation water mostly.
- (vi) The Booting Stage continues for around 40 days.

Farm Gate Price of Cotton

For the second, the unit farm gate price of cotton should be made clear because that is the damaging subject taking an international cotton price into account because that the cotton is the main international trading commodities in the agricultural sector in Tajikistan as mentioned above, and the price of cotton for international trade should follow a decision made by the Liverpool International Cotton Exchange in countries located in central Asia and Caucasus area.

The World Bank (WB) forecast the cotton price for the future. In assuming construction works for mitigation of the flood damages to be started in 2009, the cotton price should be as of 2008 as the base price of cotton. The projected international cotton price is 1,430 US\$/ton based on the WB projection⁹.

Tajikistan has no any air-cargo system. All the export commodities are usually transported by land transportation system. The cotton is transported mainly by rail-way system to Russia, but for the other countries, that is transported by mainly truck transportation.

And, according a paper¹⁰ issued by the WB, for example in Uzbekistan, there exist several fees and/or costs are needed in addition to transportation cost such as (1) entrance fee, (2) ecology tax, (3) insurance, (4) transit fee, (5) transit escort fee, (6) escort fee to customs ware-house, and (7) overstay penalty. And sometimes, some bribe is needed to make smooth performance of transition of commodities.

Also according to the said paper, there are a lot of the Governmental agencies at the “Border Crossing Point”, and they include (1) the Border Guards, (2) the Road Police, (3) the Customs Service, (4) the Drug Control Agency, and (5) the Quarantine Services in addition to (i) the Tax

⁹ “Commodity Forecast” in the Prospects for the Global Economy on the website, WB official HP.

¹⁰ Poverty Reduction and Economic Management Unit, Europe and Central Asia Region, ed. “Tajikistan-Trade Diagnostic Study” (the report No.: 32603-TJ) pp37 – 40, WB, December 13, 2005.

Administration, (ii) the Ministry of Justice, (iii) the Tajik Standard, and (iv) the Ministry of Agriculture. And, procedures of these different agencies are not properly harmonized, and each of them needs some charges and/or fees. Therefore, further costs are to be needed for bring out the commodities from the Tajikistan in addition to the transportation cost and/or transit cost as indicated above, and take a time. It means that the farm gate price of cotton might be higher than the amount of the above estimated one.

Tajikistan has no formal export tax. But, it levies the cotton sales tax for exported cotton¹¹. Therefore, the cotton sales tax can be considered as export tax.

The Government of the Republic of Tajikistan pays out as a subsidy for cotton production. However, it is no need to consider for making clear the farm gate price of cotton because that all the investment together with the said subsidy being reflected to the farm gate price is to be damaged when the flood occurs.

Some amounts of bribes are also needed during transportation from the cotton producing area to the Capital Dushanbe. From Hamadoni to Dushanbe, there are 8 check-points, and at each check-point, the said bribe is to be paid.

One ton of ginned cotton needs around 3 tons of raw cotton according to the information from official production statistics in Hamadoni and Farkhor Districts.

According to the above information and data, the farm gate price of cotton is estimated. Following table shows a summary of calculation process.

Table R 9.2.5 Estimation of Farm Gate Price of Cotton

Description	US\$ (US\$/ton)	TJS (Somoni/ton)	Cumulative Price of Cotton (Somoni/ton)
International Price of Cotton Fibre as of 2008	1,430	4,843	4,843
Transit Cost in Uzbekistan (557 US\$/10 ton-truck) estimated in 2008 (Including Entrance Fee, Ecology Tax, Insurance, Transit Fee, Transit Escort Fee, and Overstay Penalty)	66	225	5,068
Details: Entrance Fee: 130.00 US\$			
Ecology Tax: 10.00 US\$			
Insurance: 75.00 US\$			
Transit Fee: 90.00 US\$			
Transit Escort Fee: 252.00 US\$			
Escort to Customs Warehouse: 0.00 US\$			
Overstay Penalty*: 50.00 US\$			
*: Reportedly, trucks are given only 3 US\$ for transit and face penalty charges for overstaying of up to US\$110. (Source: "Tajikistan Trade Diagnostic Study", December 2005, the World Bank.)			
International Transportation Cost (7 cents/ton.km) (Assuming the average distance of 1,000 km) estimated in 2008	83	283	5,351
Sales Tax on Cotton Fibre according to Tax Code of the Republic of Tajikistan	10%	0	5,886
Domestic Transportation Cost (4 cents/ton.km) (Assuming the average distance of 200 km) estimated in 2008	10	32	5,918
Subsidy of the State for Cotton Production*	No need to be taken into consideration.		
Cost of Bribe (Information Domestic Transportation Cost) (US\$20/10 ton-truck) estimated in 2008	2	8	5,926
Conversion Factor from Raw Cotton to Ginned Cotton (1 ton of Ginned Cotton needs 3 tons of Raw Cotton)	0.33		1,976
Transportation Cost from Dekhan Farms to Ginning Factory (4 cents/ton.km, assuming the average distance of 20 km)	1	3	1,978
Gross Farm Gate Price of Raw Cotton as of 2008 (TJS/ton)			1,978

¹¹ The sales tax on cotton should be the rate of 10 % of selling value of cotton fibre according to “the Tax Code of the Republic of Tajikistan”.

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As indicated in the above table, the unit farm gate price of cotton is estimated at 1,978 TJS/ton.

Unit Amount of Damages to Cotton

Table R 9.2.6 shows a summary of land use balance in Hamadoni, and Table R 9.2.7 shows a summary of cotton cultivation area in Farkhor District.

Furthermore, Table R 9.2.8 shows a summary of production of cotton in the targeted area of Hamadoni and Farkhor together with those in the whole nation of Tajikistan and unit yield per unit area of cotton field.

As shown in the Table R 9.2.8, the unit yields of cotton in Hamadoni and in Farkhor are 2.06 tons/ha and 1.41 tons/ha respectively.

From the information and data as discussed above, unit amount of damages per unit area of cotton field can be estimated. Table R 9.2.9 shows its summary.

Table R 9.2.6 Land Use Balance in Hamadoni District with Population and HHs by Jamoat (ha)

Jamoat	Number of HHs as of 2005 (HHs)	Population as of 2005 (persons)	Total Area of Territory	Total Agricultural Area	Of which Irrigated Area	Of which: Vineyard (Grape Field)	Of which: Cotton Field
Jamoat Moskva	2,794	19,965					
Jamoat Kahramon	1,760	15,441	10,883	2,888	2,505		1,615
Jamoat Panjob	1,079	8,537	2,173	1,329	1,323	411	286
Jamoat Chubek	2,227	17,418	6,499	1,173	602	29	642
Jamoat Dashtigulo	1,828	16,015	19,097	2,353	2,280		1,548
Jamoat Kalinin	1,376	11,107	5,563	1,755	1,610		1,092
Jamoat Mehnatobod	2,052	18,449	8,529	1,480	1,320		1,080
Jamoat S. Turdiev	1,009	8,490	2,181	1,675	1,675		1,009
Total	14,125	115,422		12,653	11,315	440	7,271

Source: Hamadoni Land Committee.

Table R 9.2.7 Cotton Field in Farkhor District (as of 2007, ha)

Jamoat	Area of Cotton Field
Gulshan	2,046
Vatan	2,058
Darqad	1,146
Komsomol	1,400
Farkhor Town	0
Farkhor	1,306
Ghairat	1,430
Zafar	1,449
Dehqonoariq	1,458
Gholaba	644
Total	12,937

Source: Land Committee of Farkhor District.

Table R 9.2.8 Cotton Production in Targeted District and in Whole the Nation (Tons)

Area	Description	2000	2001	2002	2003	2004	2005	2006	Unit Yield (tons/ha)
Whole the Nation*		335,427	452,735	515,478	537,358	556,766	447,918	n.a.	
	Production	12,875	15,016	15,611	16,442	7,990	7,466	8,372	
	Unit Yield (Tons/ha)	1.77	2.06	2.14	2.26	1.10	1.02	1.15	2.06
	Share Rate to Nation (%)	3.84%	3.32%	3.03%	3.06%	1.44%	1.67%	n.a.	(In normal year)
Hamadoni**		12,625	18,284	18,744	17,465	17,841	13,896	18,806	
	Production	12,625	18,284	18,744	17,465	17,841	13,896	18,806	
	Unit Yield (Tons/ha)	0.98	1.41	1.45	1.35	1.38	1.07	1.45	1.41
	Share Rate to Nation (%)	3.76%	4.04%	3.64%	3.25%	3.20%	3.10%	n.a.	(In normal year)
Farkhor***		12,625	18,284	18,744	17,465	17,841	13,896	18,806	
	Production	12,625	18,284	18,744	17,465	17,841	13,896	18,806	
	Unit Yield (Tons/ha)	0.98	1.41	1.45	1.35	1.38	1.07	1.45	1.41
	Share Rate to Nation (%)	3.76%	4.04%	3.64%	3.25%	3.20%	3.10%	n.a.	(In normal year)

Sources: *Agricultural Statistics, State Statistic Committee. **According to officials of Hamadoni. ***According to officials of Farkhor.

Table R 9.2.9 Estimation of Unit Damages to Cotton per Unit Area

Description	Figure
Productivity of Cotton	
Hamadoni	
Average Cotton Production Volume in Hamadoni in Normal Years:	2.06 tons/ha
Cotton Production Volume in Hamadoni in Flooded Years:	1.02 tons/ha
Farkhor	
Average Cotton Production Volume in Farkhor in Normal Years:	1.41 tons/ha
Cotton Production Volume in Farkhor in Flooded Years:	1.07 tons/ha
Average Farm Gate Price of Cotton:	1,978 TJS/ton
Damages to Cotton Due to Direct Hit by Flood in Hamadoni:	4,070 TJS/ha
Damages to Cotton Due to Lack of Irrigation Water:	
Damages to Cotton in Hamadoni Caused by Lack of of Irrigation Water:	2,042 TJS/ha
Damages to Cotton in Farkhor Caused by Lack of of Irrigation Water:	662 TJS/ha

As shown in the above table, the unit amounts of damages are estimated at 4,070 TJS/ha in the area of cotton field due to direct hit by flood in Hamadoni District, 2,042 TJS/ha in the case of lack of irrigation water caused by bursting of the irrigation canal, and 662 TJS/ha in the same case.

In this case, the direct hit areas are including both the area washed out, and inundated because that, even only inundated, if the inundation depth is ranging from 0.50 m to 1.00 m as the time of 2005-Flood, the cotton is wiped out fully because that the cotton trees are shrub with less than 1.00 m of their heights.

Based on the above data, damages to cotton caused by 2005-Flood are estimated as shown in the following table.

Table R 9.2.10 Estimation of Damages to Cotton Caused by 2005-Flood

Description	Figure
Flood-Hit Area of Cotton Field by 2005-Flood (ha)	
Jamoat	Washed Out Area Inundated Area Affected Area
Qahramon	0.00 0.00 0.00
Mehnatobod	0.00 0.00 0.00
Dashtigulo	56.14 661.50 830.36
Kalini	38.13 391.06 0.00
Turdiyev	71.08 422.42 515.50
Panjob	11.67 106.11 0.00
Chubek	0.00 0.00 0.00
Total	177.01 1,581.09 1,345.86
Damages to Cotton in Hamadoni Caused by Direct Hit by the Flood:	7,155,161 TJS
Damages to Cotton Due to Lack of Irrigation Water in Hamadoni:	2,748,587 TJS
Damages to Cotton Due to Lack of Irrigation Water in Farkhor:	8,569,968 TJS
Total	18,473,717 TJS (Equivalent to 5,916,164 US\$)

4) Damages to Vineyard

As indicated in Table R 9.2.6, the area of vineyard was 440 ha in total. Average yield of grape has been 2.4 tons/ha. This unit yield is quite low comparing that in average vineyard (usually, unit yield of grape is 10 tons/ha in average vineyard) because that rocky soil in Hamadoni.

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Among the said vineyard, 50.93 ha was washed out caused by 2005-Flood. From the said data, unit amount of damages and damages to vineyard in Hamadoni caused by 2005-Flood can be estimated as shown in the following table.

Table R 9.2.11 Estimation of Unit Amount of Damages to Vineyard with Damages in Total Caused by 2005-Flood

Description	Figure
Area of Vineyard in Total*:	440.00 ha
Area of Damaged (Washed-Out) Vineyard*:	50.93 ha
Average Unit Yield of Grape in Vineyard*:	2,400 kg/ha
Average Unit Price of Grape*:	1.00 TJS/kg
Unit Damages to Vineyard:	2,400 TJS/ha
Damages of Vineyard Caused by 2005-Flood	122,232 TJS
Remarks:	
Damage Rate:	11.58% (= 50.93 ha/440 ha)

Source: * Officials of Hamadoni District.

As indicated in the above table, the unit amount of damages to vineyard is estimated at 2,400 TJS/ha. And, damages to vineyard in Hamadoni caused by 2005-Flood is estimated at 122,232 TJS in total.

5) Damages to the Other Agricultural Crops

Unit amount of damages to crops in the agricultural field other than used for cotton is assumed at the same amount those in the household plot, namely it is 1,171 TJS/ha as discussed in previous item 2) in this sub-clause.

According to estimation made by GIS, flooded area caused by 2005-Flood in Hamadoni was 984.84 ha in total. From the above unit amount of damages and this flooded area, damages to agricultural crops other than cotton in caused by 2005-Flood in Hamadoni can be estimated at 1,153,140 TJS in total (= 1,171 TJS/ha * 984.84 ha).

6) Damages to Social Infrastructure as Public Structures as Roads, Bridges, Etc.

Several kinds of damages to the social infrastructures caused by 2005-Flood are reported by the MES as (1) damages to 3 public facilities as educational, medical and social/cultural buildings, (2) damages to trunk roads, (3) damages to bridges, (4) damages to river-banks, (5) damages to canals and lodges, (6) damages to pump stations, (7) damages to transformer for electricity, (8) damages to water supply pipelines with water tanks (9) other social infrastructures, (10) damages to medical supplies, and (11) damages to livestock.



Fig. R 9.2.3 Some of Public Structures Damaged by 2005-Flood

In addition to the above damages to public structures, according to a result of site investigation, it has been cleared that 2 poles in Anjirkon and Fayzobod for electricity power supply poles were knocked down by 2005-Flood. Caused by this damage, power supply services for around of 70 % of households in Hamadoni were suspended for around 6 months. Therefore, the people living there were obliged to use kerosene lamps during the said period.

Cost of kerosene is higher than the electric power bill, so that people were obliged to burden additional fuel cost for daily life. Following table shows a summary of such additional fuel cost.

Table R 9.2.12 Estimation of Additional Payment to Fuel Caused by 2005-Flood

Description	Figure
General Background	
Number of Households in Total in Hamadoni:	13,278 HHs
Affected Number of Households for Electricity*:	70% 9,294 HHs
Average Expenditure for Electricity per HH:	15 TJS/month per HH
Alternative Fuel for Lightening and Cooking:	
	Kerosene
Unit Price of Kerosene:	3.10 TJS/litre
Consumed Volume of Kerosene per Day:	0.10 Litre/day per lamp
Number of Lamps Needed per HH:	3.00 Lamps (at least)
(1 lamp for cooking, 2 lamps for lightening and 8 hours use per day in average)	
Suspended Period of Power:	180 Days (6 months)
Estimation of Loss for Alternative fuel:	
Electricity Expenditure in Case of Without-Flood:	90 TJS/HH
Cost for Alternative Fuel:	167 TJS/HH
Additional Cost for Alternative Fuel:	77 TJS/HH
Total Additional Fuel Cost Needed Because of 2005-Flood:	719,379 TJS

Table R 9.2.13 hereunder shows a summary of damages to social infrastructure as public structures including the said additional payment for alternative fuel cost.

7) Additional Cost Needed for Evacuation

At the time of 2005-Flood occurred, the MES, the Central Asian Development Agency (CADA), the Save the Children Federation, etc. have supported flood-affected people for first-aid and/or for evacuation by means of preparing such back-up goods and supplies as foods, water, and several supplies for daily use including washing basin, buckets, mugs for drinking water, plastic jerry cans, detergent. Some large size machines and/or equipment as generators, water tanks for 3.5 tons are also supplied to the evacuated peoples.

Table R 9.2.13 Estimated Damages to Public Structures Caused by 2005-Flood
(As of 2005, 3.12 TJS/US\$)

Description	Figure	
	US\$	TJS
1. Damages to 3 public facilities as educational, medical and social/cultural buildings*:	786,700	2,456,536
2. Damages to trunk road for vehicles, 4.4 km*:	165,000	515,226
3. Damages to bridges, 3 bridges*:	5,000	15,613
4. Damages to river-bank, 5.2 km*:	2,781,800	8,686,402
5. Damages to canals and lodges, 7.1 km*:	984,500	3,074,183
6. Damages to pump-stations for wells and irrigation, 11 pumps*:	53,800	167,995
7. Damages to transformer for electricity, 1 unit*:	1,500	4,684
8. Damages to water supply pipeline including water-tank together with its tower, 3 units*:	26,000	81,187
9. Other social-infrastructures, 10 places*:	49,800	155,505
10. Damages to medical supplies*:	7,188,439	22,446,500
11. Damages to livestock, 64 heads*:	14,100	44,028
12. Suspension of Power Supply**:	230,379	719,379
Total	12,287,018	38,367,239

Source: *MES. **Information collected by the site investigation made by JICA Study Team.

Table R9.2.14 hereunder shows a summary of such back-up supplies with costs burdened by organizations concerned.

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Table R 9.2.14 Summary of Costs Needed for Back-Up Services, Goods and Supplies for Evacuated Peoples at the Time of Occurrence of 2005-Flood

(**As of 2005, 3.12 TJS/US\$)

Back-Up Supplies Prepared	Prepared Volume	Unit Price (TJS)	Value (TJS)*	Remarks		
Central Asian Development Agency (=CADA)¹			49,327	Other Supplies and Services to be needed ⁴ :	(CHF 1.00 =	2.45 TJS)
Wheat Flour (kg)	23,050	0.85	19,593	Back-UP Supplies:	CHF	TJS
Chickpeas (kg)	7,376	2.50	18,440	Tents, some of evacuated families	250 /pc	613 /pc
Oil (litres)	2,305	3.25	7,491	Plastic Sheeting rolls,	100 /roll	245 /roll
Sugars (kg)	1,383	2.50	3,458	Clothing and textstile, some	some	
Salt (kg)	461	0.75	346	Cooking sets,	50 /set	123 /set
Save the Children Federation, US²			32,144	Mattresses,	11 /unit	27 /unit
Washing basin (pcs)	695	27.50	19,113	Blanlets,	11 /unit	27 /unit
Bucket with cover (pcs)	695	8.00	5,560	Bedlinen,	12 /set	29 /set
Mugs for water (pcs)	695	2.00	1,390	Pillows,	5 /unit	11 /unit
Plastic jerry cans (pcs)	695	6.50	4,518	Soes and socks	some	
Soap (pcs)	695	0.50	348	Plastic buckes,	6 /unit	15 /unit
Detergent (pcs)	695	1.75	1,216	Back-Up Services		
Ministry of Emergency Situation (MJS)³			5,211	Transport, storage and vehicle costs	some	
Water filter (sets)	5	45.00	225	Personel from abroad	some	
Generator (sets)	2	300.00	600	Local personel	some	
Water tank for 3.5 tons*	2	2,185.81	4,372	Travel cost and communication cost	some	
Plastic sheets	8	1.75	14	Administrative, office and general expenses	some	
Total			86,681	Secretariat operation support	some	

Sources:

1. Reported by "United Nation Coordination Unit".
2. Reported by "Save the Children Federation".
3. Reported by "REACT".
4. Reported by "Red Crescent Society of Tajikistan".

(Note) * Prices are current price by a market survey made by JICA Study Team.

The amount of costs for back-up supplies as indicated in the above table, 86,681 TJS in total, is only reported one. In addition to the cost indicated in the above table, costs for personnel for back-up services including daily allowance and travel costs, transportation of goods, storage and vehicles, etc. Therefore, the actual amount needed for back-up services/activities must be higher than the said amount.

If the 2005-Flood has not been occurred, the costs mentioned above were to need not to pay out. From this viewpoint, it may say that the cost for back-up services is a kind of loss caused by the flood, and it can be saved due to execution of the Project.

8) Summary of Damages

Following table shows a summary of the Unit Damage Amount by each damage item based on the above discussed damage status.

Table R 9.2.15 Summary of Unit Damages by Damageable Items per Unit Area

Description	Damages to Houses and Household Movables incl. Agricultural Tools			Damages to Products in Household Plot	Damages to Cotton			Damages to Agricultural Products Other Than Grape in Vine-Yard	Damages to Social Infra-structure Together with Additional Cost for First-Aid and Evacuation	
	Totally Destroyed Houses	Partially Destroyed Houses	Inundated Houses		Damages to Cotton Due to Direct Hit by Flood in Hamadoni	Damages to Cotton in Hamadoni Caused by Lack of Irrigation Water	Damages to Cotton in Farkhor Caused by Lack of Irrigation Water			Damages to Vine-yard
Unit Amount of Damages	802,147	490,443	303,420	1,171	4,070	2,042	662	2,400	1,171	64.35%

In the case of damages to social infrastructures together with additional cost for first-aid and evacuation indicated in the above table, both the damages and saving amounts of damages to the public structures and the amount of costs for the back-up goods, supplies and services for evacuation activities are included in terms of percentage of the total direct damages based on the

damages caused by 2005-Flood summarized hereunder. The said percentage of 64.35 % is quite high rate in the time of 2005-flood.

For the economic evaluation, the rate of the said damages to social infrastructure including public structures is assumed at 10 % based of the similar projects in developing countries from a conservative viewpoint.

Following table shows the other summary of estimation of damages caused by 2005-Flood based on discussed above.

Table R 9.2.16 Summary of Damages Caused by 2005-Flood in Hamadoni including Production Reduction in Hamadoni and Farkhor Districts Due to Lack of Irrigation Water

Description	Damages to Houses and Household Movables incl. Agricultural Tools			Damages to Products in Household Plot	Damages to Cotton			Damages to Vine-Yard	Damages to Agricultural Products Other Than Cotton and Grape in Vine-Yard	Damages to Social Infra-structure	Cost for First-Aid and Evacuation
	Totally Destroyed Houses	Partially Destroyed Houses	Inundated Houses		Damages to Cotton Due to Direct Hit by Flood in Hamadoni	Damages to Cotton in Hamadoni Caused by Lack of Irrigation Water	Damages to Cotton in Farkhor Caused by Lack of Irrigation Water				
	Estimated Damages	615,212	359,554		513,331	7,155,161	2,748,587				
Total			1,488,097	61,777		18,473,717	122,232	1,153,140	38,367,239	86,681	
Grand Total:										59,752,883	
(In US\$										19,135,721	

Following photo shows a scene of inundation by 2005-Flood several days after the occurrence of the flood. According to a report of CARE, the flood has occurred on June 22, 2005.



Photo: Muzafar Yusufov, Investigator, General Prosecutor Office, Dushanbe.

Fig. R 9.2.4 A Scene of Inundation on Agricultural Area by 2005-Flood¹²

9.2.2 Identification of Economic Benefit

Economic flood control benefit is defined as the damages reduction by the Project. For making clear the flood control benefit, a probability analysis is to be made for making clear annual average flood damages for designed flood scale.

(1) Estimation of Probable Flood Damages

Following table shows a summary of estimated inundated area by probable flood scale in each return period. Details are shown in Annex 9.2.1 through 9.2.6.

¹² Mr. Muzafar Yusufov is usually working in Dushanbe as an Investigator of General Prosecutor Office. He happened to be in Hamadoni with making something came at that time, and faced with the flooding. He had a video-camera at that time, and shot a series of elapse of flooding. The above photo is one of scenes excerpted from the vide-tape.

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Table R 9.2.17 Summary of Inundated Area by Probable Flood Scale

(ha)

Return Period	Irrigated Agricultural Area									Built-Up Area		
	Total	Cotton Field			Influenced Cotton Field for Irrigation Water	Vineyard	Field for Other Vegetables			Inundated Area		
		Sub-Total	Washed Out Area	Inundated Area			Sub-Total	Washed Out Area	Inundated Area	Total	Floor Area of Houses in Total	Household Kitchen Garden (HH Plot)
5-year	2,559.22	1,589.11	158.70	1,430.41	1,458.33	48.39	921.72	123.46	798.26	52.60	3.00	49.60
10-year	2,733.25	1,703.16	171.95	1,531.21	1,364.76	50.37	979.73	132.90	846.83	54.57	3.11	51.46
20-year	7,639.00	4,595.23	246.90	4,348.33	1,479.99	135.88	2,907.89	233.80	2,674.09	118.18	6.74	111.44
30-year	7,702.47	4,635.13	249.11	4,386.02	1,665.06	136.35	2,930.99	235.35	2,695.64	120.15	6.85	113.30
50-year	7,863.99	4,736.60	252.77	4,483.83	2,060.30	137.47	2,989.92	238.15	2,751.77	121.50	6.93	114.57
100-year	8,093.18	4,873.83	255.64	4,618.19	1,973.94	148.87	3,070.48	241.79	2,828.69	123.01	7.02	115.99

Using the inundated area by probable flood scale in each return period indicated in the above table and unit amount of damages in each damageable item indicated in the Table R 9.2.15 above, the probable flood damages may be calculated as shown in the Table R 9.2.18.

In this case, damages to houses and household movables should be taken into consideration because of the following reason.

- (i) Households that are suffered damages caused by 2005-Flood in “totally destroyed houses” and some of “partially destroyed houses” have already been moved to the other living places.

Table R 9.2.18 Summary of Probable Damages in Each Return Period

(1,000 TJS)

Description	Damages to Houses and Household Movables incl. Agricultural Tools			Damages to Crops in Household Plot	Damages to Cotton			Damages to Vineyard	Damages to Agricultural Products Other Than Cotton and Grape in Vineyard	Damages to Social Infrastructure	Grand Total
	Totally Destroyed Houses	Partially Destroyed Houses	Inundated Houses		Damages to Cotton Due to Direct Hit by Flood in Hamadoni	Damages to Cotton in Hamadoni Caused by Lack of Irrigation Water	Damages to Cotton in Farkhor Caused by Lack of Irrigation Water				
5-Year Flood	578	338	483		6,467	2,978	13,737				
Amount of Counted Damages:			483	58	Total of the above:	23,183	116	1,079	2,492	27,411	
10-Year Flood	600	351	501		6,932	2,787	13,737				
Amount of Counted Damages:			501	60	Total of the above:	23,456	121	1,147	2,528	27,813	
20-Year Flood	1,299	759	1,084		18,702	3,023	13,737				
Amount of Counted Damages:			2,168	130	Total of the above:	35,461	326	3,405	4,149	45,640	
30-Year Flood	1,321	772	1,102		18,864	3,400	13,737				
Amount of Counted Damages:			2,221	133	Total of the above:	36,002	327	3,432	4,211	46,326	
50-Year Flood	1,336	781	1,115		19,277	4,208	13,737				
Amount of Counted Damages:			2,257	134	Total of the above:	37,222	330	3,501	4,344	47,788	
100-Year Flood	1,352	790	1,128		19,836	4,031	13,737				
Amount of Counted Damages:			2,297	136	Total of the above:	37,604	357	3,595	4,399	48,388	

- (ii) Therefore, when the flood will occur in the future, there will no any damages until the same scale of floods with 2005-Flood because that there is no any damageable houses and/or household properties until the such scale of floods.
- (iii) From this viewpoint, damages called as “amount of counted damages” indicated in the above table means the damages to be remained after deducting the said moved-away properties.

Based on the above mentioned probable damages in each return period, annual average flood damages can be estimated as shown in following table.

Table R 9.2.19 Estimation of Annual Average Flood Damages by Return Period

(1,000 TJS)						
Return Period	Annual Average Probability of Exceedance	Probability of Occurrence	Flood Damages by Return Period	Average Amount of Assumed Damages	Average Annual Amount of Probable Damages	Accumulated Amount of Probable Damages
5-year	0.2000	0.8000	27,411	13,705	10,964	10,964
10-year	0.1000	0.1000	27,813	27,612	2,761	13,725
20-year	0.0500	0.0500	45,640	36,727	1,836	15,562
30-year	0.0333	0.0167	46,326	45,983	766	16,328
50-year	0.0200	0.0133	47,788	47,057	627	16,956
100-year	0.0100	0.0100	48,388	48,088	481	17,436

(2) Identification of Economic Benefit

According to the annual average flood damages as indicated in the Table R 9.2.19, the annual average flood damages may be increased corresponding to the return periods or to the probability of floods, or frequency of occurrence by flood scale as a pattern shown in Fig. R9.2.5 hereunder.

By using a formula derived from the damages curve shown in Fig. R9.2.5, the most likely accumulated amount of damages of probable floods can be estimated as shown in Table R 9.2.20.

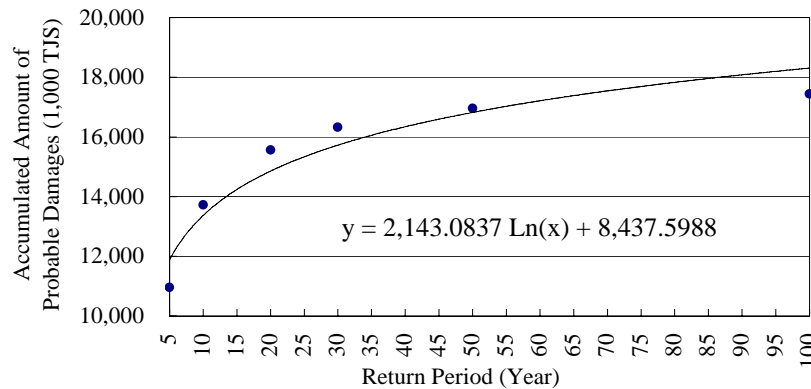


Fig. R 9.2.5 Damages Curve Corresponding to Return Period

Table R 9.2.20 Result of Estimation of Expected Cumulative Amount of Benefit

(1,000 TJS)	
Return Period	Estimated Cumulative Amount of Benefit
5-year	11,887
10-year	13,372
20-year	14,858
30-year	15,727
50-year	16,821
100-year	18,307

As mentioned in previously, the economic benefit is the amount of mitigated damages. Therefore, if the designed scale of the Project for Short Term Plan is 30-year in return period, the economic benefit is to be TJS 16 million (equivalent to US\$ 4,573 thousand, or Japanese Yen 557 thousand).

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If the designed flood scale for medium/long term construction works is 100-year in return period, the economic benefit is to be TJS 18.3 million (equivalent to US\$ 5,323 thousand, or Japanese Yen 648 thousand).

The economic benefit will derive after completion of each term of works of the Project.

9.2.3 Identification of Project Cost

(1) Standard Conversion Factor (SCF)

A Standard Conversion Factor (SCF) is estimated as 0.98658 based on the international trade statistics and the data on tax revenue data from the Ministry of Revenue and Tax Collection shown in the following table.

SCF is calculated by the following formula.

$$SCF = \frac{\sum I + \sum E}{(\sum I + \sum I_{customs}) + (\sum E - \sum E_{tax} + \sum E_{subsidy})}$$

Where, SCF = Standard Conversion Factor,

I = Import Amount,

E = Export Amount,

$I_{customs}$ = Import Duties (Custom Duties),

E_{tax} = Export Tax, and

$E_{subsidy}$ = Export Subsidy

Following table shows the calculation process of SCF.

Table R 9.2.21 Calculation of Standard Conversion Factor

(1,000 TJS)					
Year	Import*	Export*	Import Duties (Custom Duties)**	Export Tax	Export Subsidies
2000	1,597,995	1,559,844	29,290	0	0
2001	1,597,018	1,513,491	45,766	0	0
2002	1,912,992	1,939,667	54,882	0	0
2003	2,696,313	2,441,137	73,008	0	0
2004	4,088,678	2,720,152	97,131	0	0
Total	11,892,995	10,174,292	300,075	0	0

Source: *National Bank of Tajikistan (NBT)

SCF = 0.98658

** Ministry of Revenue and Tax Collection.

As shown in the above table, SCF is to be 0.98658.

(2) Personal Income Tax

Usually, a project cost consists of cost for equipment and materials, and cost for men-power as personnel expenses and labor cost. For the cost for this men-power, personal income tax is one of transfer items. Therefore, the amount of personal income tax should be deducted from the Project cost. Of course, personal income tax may consist of several levels in percentage. In this Project, the rate of 8 % is applied as the minimum rate according to the Income Tax Code of Tajikistan (Article 140.1).

(3) Shadow Wage Rate

The JICA Study Team has an experience to contract with a local contractor. The agreed unit cost for the foremen was 4 TJS/day and that for labors was 2.4 TJS/day in signed contract. It

means that the weighted average unit cost for men-power was around 3 TJS/day¹³. Therefore, their average monthly unit wage level was 75 TJS/month (3 TJS/day * 25 days).

On the other hand, average market wage rate, namely the average shadow wage level in Hamadoni can be estimated for the year 2006 by using a formula indicated in Fig.R9.1.5 in previous sub-clause 9.1.8, namely “ $y = 0.79125x^2 - 3,160.65575x + 3,156,321.31050$ ”. It was resulted at 64 TJS/month as of 2006.

From these 2 data, a conversion factor for the average shadow wage rate can be calculated at 85 % (= 64 TJS/month / 75.00 TJS/month).

Because that the contractor should not pay wages to their labors as contracted. The contracted unit wage rate must include a margin for the contractor. Therefore, the said conversion factor is applied for estimation of economic wage rate for economic evaluation.

(4) Shadow Price of Land

Any costs for land acquisition and house-removing compensation do not need for the Project. So that, a conversion factor for making clear a shadow price of land is not required to calculate in the Project.

(5) Taxes

Any kind of taxes are transfer items. Therefore, the taxes, if any, should be deducted from the financial cost for converting into the economic cost.

In the Project, the value added tax (VAT) of 20 %¹⁴ is applied for estimation of the financial Project cost. So, it should be deducted from the said financial cost.

(6) Social Insurance, Social Security, Etc.

Any cost for social insurance, or social security aiming for safety or safety's sake for workers is also the other transfer items because that such amounts are saved for making fund for protection of peoples. In the Project, 25 % is applied, and the amount calculated based on this rate is deducted from the financial cost.

(7) Corporate Profit Tax

According to the cost estimates from the contractor in the case of the Pilot works, contractor's net profit was counted at 15 % of the net cost of civil works. According to the Tax Code of the Republic of Tajikistan, the corporate profit tax should be levied to the net profit of contractors at the rate of 25 %. This corporate profit tax is also a transfer item, so the said corporate profit tax should also be deducted from the financial cost.

(8) Others

- Price escalation should not be included in the cost side because that the cost and the benefit should compare in terms of their present value.
- Discount Rate of 10% is to be applied based on the similar projects in the other developing countries.
- Project life is to set at 50 years after completion of the construction works as mentioned above.

¹³ In the Pilot Works of this Project, estimated men-months of 10 labors per 1 foreman have been applied. So that, the weighted average of wage rate was estimated at 2.55 TJS (= ((1 TJS * 1 foreman) + (2.4 TJS * 10))/10). In the report, rounded amount of average unit wage rate of 3 TJS is applied aiming for safety and smooth performance of the works.

¹⁴ Based on the Tax Code of the Republic of Tajikistan.

(9) Identified Economic Cost

Following Table shows a summary of estimation process of the economic cost from the financial cost. Details are shown in Annex 9.2.7.

Table R 9.2.22 Summary of Estimation Process of Economic Cost of Project

Description	(1,000 TJS)								
	Total Cost in Short Term			Total Cost in Medium/Long Term			Grand Total of All the Terms		
	LC	FC	Total	LC	FC	Total	LC	FC	Total
Cost for Civil Works	54,373	8,959	63,332	66,059	12,652	78,711	120,433	21,611	142,043
Engineering Fee (Cost for Consulting Services)	1,183	5,916	7,099	1,462	6,364	7,827	2,645	12,281	14,926
Administration Cost	580	0	580	525	0	525	1,106	0	1,106
Physical Contingency	1,061	237	1,298	1,402	350	1,752	2,463	587	3,050
Value Added Tax (VAT)	13,282	0	13,282	17,888	0	17,888	31,170	0	31,170
Sub-Total (Net Financial Project Cost)	70,479	15,112	85,591	87,337	19,366	106,703	157,816	34,478	192,294
Price Contingency	9,362	157	9,519	18,173	211	18,384	27,535	368	27,903
Financial Cost in Total (Incl. Price Contingency)	79,841	15,269	95,110	105,510	19,578	125,087	185,351	34,846	220,197
Economic Cost in Total	89,203	15,425	104,628	84,432	19,046	103,478	173,635	34,471	208,106

These Project costs are to be allocated annually as shown in the following table.

Table R 9.2.23 Annual Disbursement Schedule of the Project Cost

Description	Grand Total	Short Term Works					Total
		2009	2010	2011	2012	2013	
Financial Cost							
Excluding Price Contingency	192,294	3,294	2,826	23,843	23,843	31,785	85,591
Including Price Contingency	220,197	3,490	2,987	26,332	26,560	35,741	95,110
Economic Cost (excl.Price Contingency)	208,106	3,088	2,637	19,091	19,091	25,449	104,628

Description	Medium/Long Term Works						Total
	2014	2015	2016	2017	2018	2019	
Financial Cost							
Excluding Price Contingency	1,903	20,960	20,960	20,960	20,960	20,960	106,703
Including Price Contingency	1,977	24,008	24,288	24,594	24,928	25,293	125,087
Economic Cost (excl.Price Contingency)	1,755	19,374	19,816	20,300	20,828	21,406	103,478

In addition to the said Project cost, operation and maintenance cost (OM Cost) is to be needed after completion of each term of the works.

After completion of the works of Short Term Plan, the OM Cost is needed at a sum of TJS 30 thousand in financial terms (a sum of TJS 24 thousand in economic terms) in each year. And after completion of medium/long term works, the OM Cost is needed at a sum of TJS 70 thousand in financial terms (a sum of TJS 56 thousand in economic terms) in each year too to the end of the Project life.

9.2.4 Economic Evaluation

Economic evaluation for the Project is made by using a cash stream as shown in Annex 9.2.8 through Annex 9.2.9 taking the said conditions and assumption into account. Results are summarized as follows:

Table R 9.2.24 Result of Economic Evaluation of Project

Description	Short Term Works	Medium/Long Term Works
	NPV	40,199
EIRR	18.41%	11.59%
B/C Ratio	2.01	1.14

As shown in the above table, EIRRs of both the Short Term Plan and Medium/Long Term Plan are higher as 18.41 % and 11.59 % respectively than the rate of discount rate applied. The

other indices as NPV and B/C Ratio are also positive and higher than “1.00” with enough rooms. It means that the Project has enough viability to execute.

Especially, result of evaluation for the Short Term Plan shows high advantages to execute the Project in terms of all the indices of NPV, EIRR and B/C Ratio reflecting its peculiarity as emergency disaster prevention measures.

9.2.5 Sensitivity Analysis

The economic internal rate of return (EIRR) changes its value depending on the parameters employed for the estimation. Out of these parameters, the construction cost of the Project and its benefit are the most important determinants of the economic analysis depending upon the price fluctuation in Tajikistan.

As discussed in previous sub-clause 9.1.10 and as indicating in Table R 9.1.16, overall consumer price index (CPI) has fluctuated ranging from 5.62 % to 14.50 % against previous year since 2000. Average CPI against previous year is calculated at 9.29 % as shown in the said table. For execution of construction works of the Project, it should be made clear a feasibility even increasing of prices will progress by rather high rate from a viewpoint of safety’s sake.

From the above viewpoint, a Sensitivity Test is made for 2 work plans as the Short Term Plan and the Medium/Long Term Plan in 49 cases in combination in each terms of works as (1) Cost: 20 % up, (2) Cost: 15 % up, (3) Cost: 10 % up, (4) Cost: 10 % down, (5) Cost: 15 % down, (6) Cost: 20 % down in addition to (7) the cost in the base case both under the condition of (8) Benefit: 20 % up, (9) Benefit: 15 % up, (10) Benefit: 10 % up, (11) Benefit: 10 % down, (12) Benefit: 15 % down, (13) Benefit: 20 % down in addition to (14) the benefit in the base case. Result is shown in the following tables for the works of Short Term Plan and the Medium/Long Term Plan.

Table R 9.2.25 Result of Sensitivity Test for EIRR of Both the Short and Medium/Long Term Plans

Cost	Benefit in Short Term Plan							Benefit in Medium/Long Term Plan						
	20%	15%	10%	Base	-10%	-15%	-20%	20%	15%	10%	Base	-10%	-15%	-20%
20%	18.41%	17.77%	17.12%	15.79%	14.42%	13.72%	13.01%	11.59%	11.06%	10.54%	9.49%	8.44%	7.91%	7.38%
15%	19.07%	18.41%	17.74%	16.37%	14.96%	14.24%	13.51%	12.13%	11.59%	11.04%	9.95%	8.85%	8.30%	7.75%
10%	19.78%	19.10%	18.41%	17.00%	15.55%	14.80%	14.04%	12.73%	12.16%	11.59%	10.44%	9.30%	8.73%	8.15%
Base	21.38%	20.65%	19.92%	18.41%	16.86%	16.06%	15.25%	14.10%	13.47%	12.84%	11.59%	10.33%	9.70%	9.07%
-10%	23.26%	22.48%	21.70%	20.08%	18.41%	17.55%	16.68%	15.77%	15.08%	14.38%	12.98%	11.59%	10.89%	10.19%
-15%	24.33%	23.53%	22.71%	21.04%	19.30%	18.41%	17.50%	16.76%	16.02%	15.28%	13.80%	12.32%	11.59%	10.85%
-20%	25.51%	24.68%	23.83%	22.09%	20.29%	19.36%	18.41%	17.86%	17.08%	16.30%	14.73%	13.16%	12.37%	11.59%

And, the sensitivity of EIRRs of the works of both the Short Term Plan and Medium/Long Term Plan of the Project is illustrated in the following figures.

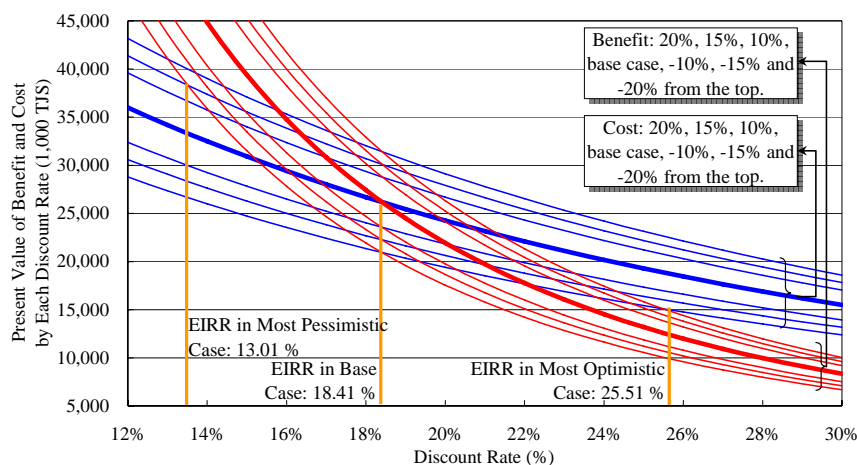


Fig. R 9.2.6 Sensitivity of EIRR for Works of Short Term Plan

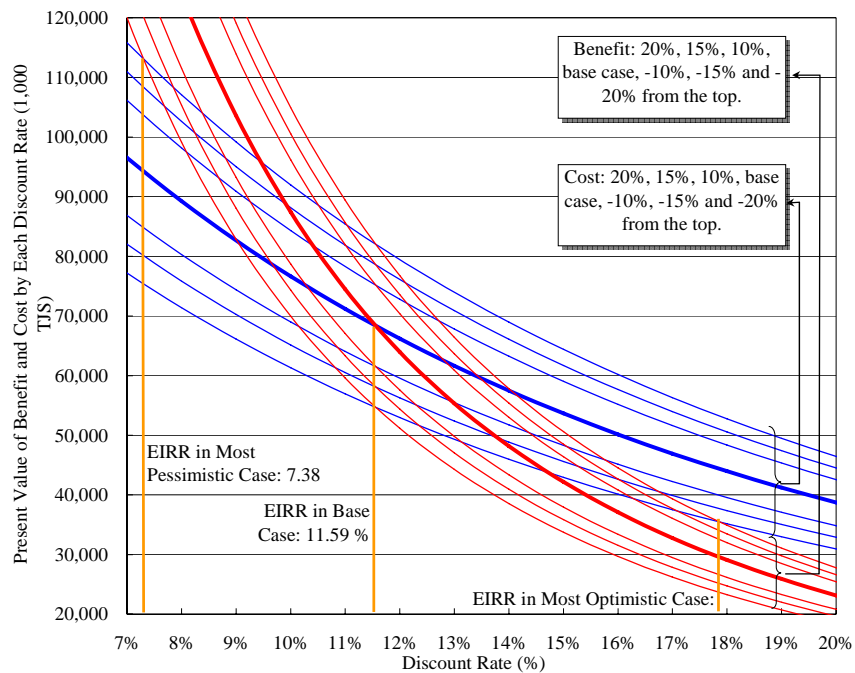


Fig. R 9.2.7 Sensitivity of EIRR for Works of Medium/Long Term Plan

Short Term Plan

As indicated in the above table, in the most optimistic case as Cost: 20 % down and Benefit 20 % up, the EIRR for the Short Term Plan will reach by the rate of 25.51 %. Moreover, even in the most pessimistic case as Cost: 20 % up and Benefit: 20 % down, the EIRR will still be kept at the higher rate than the applied discount rate of 10 % as 13.01 %. It means that the Short Term Plan has enough feasibility to execute.

Medium/Long Term Plan

Also as shown in the above table, the EIRR in the optimistic case as Cost: 20 % down and Benefit: 20 % up will reach by the rate of 17.86 %. However, the EIRR for the Medium/Long Term Plan in the most pessimistic case as Cost: 20 % up and Benefit: 20 % down will become at the rate of 7.38 %.

For execution of the Project, the EIRR should be higher than the applied discount rate as the rate of opportunity cost of capital as mentioned in previously (refer to sub-clause 9.2.1).

When checking carefully a part for the Medium/Long Term Plan of the said table, (1) in the case of Cost: 10 % up and Benefit: base case, and (2) in the case of Cost: base case and Benefit: 10 % down, the EIRRs are higher than the applied discount rate as 10.44%, and 10.33 % respectively. It means that the Medium/Long Term Plan of the Project has feasibility within the said ranges of price fluctuation.

9.3 FINANCIAL ANALYSIS

9.3.1 Financial Evaluation of Project

The Project is a pure public works without any collection of charge and/or fees from the people. Therefore, the financial evaluation does not match the Project.

9.3.2 Analysis of Repayment Ability

An analysis for repayment ability is to be made in the feasibility study stage. The study under executing is for formulation of a Master Plan. Therefore, the analysis of the repayment ability should be waited for the feasibility study stage because that the cost estimated in this stage is not so much detail as directly linking with the actual construction works of the Project.

9.4 CONCLUSION

The Project consisting of the Short Term Plan and Medium/Long Term Plan has enough viability to execute with enough rooms with the rate of EIRRs, 18.41 % for the Short Term Plan and 11.59 % for the Medium/Long Term Plan.

Especially, result of evaluation for the Short Term Plan shows high advantages to execute the Project in terms of all the indices of NPV, EIRR and B/C Ratio reflecting its peculiarity as one of emergency disaster prevention measures in Tajikistan.

ANNEXES

Annex 9.1.1 Balance of Payment

(million TJS)						
Description	2000	2001	2002	2003	2004	2005
1. Current Account	-115	-141	-55	-15	-170	-59
Balance on Goods and Services	-141	-282	-452	-467	-669	-1,336
Balance on Goods	-152	-265	-344	-366	-403	-1,008
Exports (fob)	1,560	1,513	1,945	2,772	3,261	3,460
Imports (fob)	-1,711	-1,779	-2,290	-3,138	-3,664	-4,468
Balance on Services	10	-17	-108	-101	-266	-328
Transportation Services	27	-2	-100	-141	-316	-383
Travel	-1	-2	0	-2	-7	-7
Communication Services	2	2	4	20	24	18
Construction Services	-2	4	-10	-16	-25	-73
Insurance Services	-10	-14	-15	-22	-35	-43
Financial Services	-1	-5	0	0	-1	13
Other Services	-5	0	14	60	94	147
Income	-38	-43	-114	-215	-171	-127
Workers Remittances	0	0	-1	0	0	0
Direct Investment Income	0	0	0	-2	-4	-7
Portfolio Investment Income	0	0	0	-	0	0
Other Investment Income	-39	-43	-114	-213	-167	-121
Balance on Transfers	64	184	512	667	671	1,405
Transfers Inflows	68	216	561	872	1,036	1,873
Transfers Outflows	-3	-32	-49	-205	-365	-468
2. Capital and Financial Account	206	228	315	230	-269	464
Financial Account	206	228	315	230	-269	464
Direct Investment	44	22	100	42	809	170
Portfolio Investment	1	0	4	1	16	0
Other investment	81	103	97	94	-547	147
Assets (- increase)	-117	-37	-49	-48	-85	-223
Foreign exchange	-1	-2	0	-21	-10	5
Currency and deposits	-4	5	-19	-23	-12	-110
Trade credits	-116	-28	-44	-9	-62	-116
Loans	7	1	0	-	0	0
Other assets	-4	-13	13	5	-1	-2
Liabilities (+ increase)	198	140	162	142	-462	369
Currency and deposits	11	3	3	11	3	122
Trade credits	143	39	42	131	-47	74
Loans	13	-76	-26	-6	-450	155
Other liabilities	31	173	143	6	32	17
3. Net Errors and Omissions	-33	-29	-72	-93	-97	-241
4. Overall Balance	-23	-46	83	84	12	17
5. Financial Items	23	46	-16	-84	-12	-17
Reserve assets (-increase)	-54	-17	-2	-123	-137	-77
Loans IMF	29	8	-1	-8	49	48
Capital transfers	8	35	51	42	76	0
Arrears	39	-110	-65	4	0	12
Rescheduling	0	131	0	-	0	0

Source: The National Bank of Tajikistan (NBT).

Sector 9
Economics & Finance

Annex 9.1.2 Consumer Price Index (CPI)

(2000 = 100)

Description	2000	2001	2002	2003	2004	2005	2006	Annual Increasing Ratio
Overall CPI, o/w:	100.00	112.48	128.79	146.38	154.61	165.26	186.23	9.29%
All Goods, o/w:	100.00	114.39	131.37	144.14	151.32	161.73	181.25	8.87%
Foodstuff, Including Alcohol Drinks	100.00	117.87	138.11	151.90	158.80	172.06	196.49	10.13%
Non-Food	100.00	99.21	105.53	114.28	121.41	124.73	131.36	3.97%
Services	100.00	86.06	94.77	145.18	161.58	176.43	210.23	11.20%
Foodstuff, Including Alcohol Drinks	100.00	117.87	138.11	151.90	158.80	172.06	196.49	10.13%
Meat & Meat Products	100.00	131.05	199.92	267.37	268.40	302.86	395.34	21.70%
Fish	100.00	101.52	113.24	151.41	165.99	181.77	198.16	10.26%
Animal Oil	100.00	107.67	111.82	128.20	138.46	160.24	166.21	7.53%
Vegetable Oil	100.00	119.49	156.99	154.77	159.44	154.84	185.33	9.21%
Milk & Milk Products	100.00	105.63	121.39	136.36	156.98	179.00	192.77	9.83%
Eggs	100.00	102.31	121.57	136.26	151.66	165.77	210.44	11.21%
Sugar & Confectionery	100.00	120.46	113.07	112.46	122.14	131.98	160.96	7.04%
Bread of First Grade Wheat Flour	100.00	104.08	105.26	132.90	136.64	136.64	136.64	4.56%
Wheat Flour, First Grade	100.00	103.78	92.42	129.54	132.62	127.77	132.01	4.05%
Pasta	100.00	104.09	102.87	109.90	120.69	126.47	126.67	3.44%
Rice	100.00	129.20	150.27	134.87	135.67	206.90	241.69	13.44%
Tobacco	100.00	77.55	79.84	85.12	89.45	90.16	91.62	-1.24%
Potatoes	100.00	111.36	183.19	155.55	138.67	257.75	405.23	22.13%
Fruits	100.00	115.94	263.86	310.22	314.73	315.43	271.78	15.35%
Vegetables	100.00	207.37	271.45	201.52	218.70	157.01	201.27	10.51%
Non-Food Goods	100.00	99.11	105.21	113.96	121.07	124.38	130.99	3.93%
Fabric, o/w:	100.00	95.03	100.34	113.01	121.84	124.17	125.27	3.27%
cotton	100.00	104.77	124.64	169.27	173.52	178.04	180.19	8.78%
Clothes & underwear	100.00	95.60	103.81	110.87	116.05	118.63	122.19	2.90%
Shoes	100.00	112.19	116.45	124.94	142.07	143.05	148.60	5.82%
Detergents	100.00	102.42	107.38	116.14	115.20	115.78	128.89	3.69%
Furniture	100.00	78.23	81.57	85.13	89.21	91.64	95.35	-0.68%
Household electrical appliances	100.00	74.11	79.03	81.77	85.17	84.99	87.89	-1.83%
Printed articles	100.00	99.94	110.97	115.77	136.71	141.47	143.19	5.26%
Recreational goods	100.00	78.65	83.00	86.37	85.33	84.73	85.50	-2.21%
Construction materials	100.00	99.48	107.13	123.59	134.57	139.70	151.76	6.14%
Medicines	100.00	99.63	108.54	107.51	114.78	121.94	126.31	3.39%
Gasoline	100.00	67.79	70.56	121.78	126.76	163.16	168.00	7.69%

Source: The National Bank of Tajikistan (NBT).

Annex 9.2.1 Inundated Area by Land Use Category in Hamadoni in 5-Year Probable Flood

A. General Land Use Balance and Inundated Area Caused by 5-Year-Flood (as of 2007, ha)

Jamoat	Total Area of Administrative Territory in Each Jamoat ⁽²⁾	Arable (Agricultural) Area in Total ⁽¹⁾				Inundated Area			Washed Out Area in Total Agricultural Inundated Area ⁽³⁾
		Irrigated Area		Non-Irrigated Area	Irrigated Agricultural Area ⁽²⁾	Built-Up Area ⁽²⁾	Total ⁽³⁾	Irrigated Area ⁽³⁾	
		Total	Of which: Cotton Field in Total						
Moskva	327.95	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qahramon	4,152.53	2,505.00	1,615.00	382.00	2,887.00	0.00	0.00	0.00	0.00
Dashrigulo	3,630.97	2,280.00	1,548.00	38.00	2,318.00	930.30	19.89	236.00	77.27
Mehnatobod	6,244.77	1,320.00	1,079.50	160.00	1,480.00	0.00	0.00	0.00	0.00
Kalinin	2,582.26	1,610.00	1,092.00	147.00	1,757.00	549.55	23.80	153.82	51.26
Turdiev	3,093.36	1,675.00	1,009.00	0.00	1,675.00	611.97	3.67	136.65	102.35
Panjob	4,017.95	1,494.20	286.00	6.00	1,500.20	520.00	5.24	205.76	51.28
Chubek	23,974.10	1,389.00	655.00	725.00	2,114.00	0.00	0.00	0.00	0.00
Total	48,023.87	12,273.28	7,284.50	1,458.00	13,731.20	2,611.82	52.60	732.23	282.15

B. For Estimation of Damages to Agricultural Area

(ha)

Jamoat	Total ⁽²⁾	Irrigated Agricultural Area ⁽²⁾										Built-Up Area		
		Cotton Field		Influenced Cotton Field for Irrigation Water ⁽⁴⁾		Vine-Yard		Field for Other Vegetables		Inundated Area		Floor Area of Houses in Total ⁽⁵⁾	Household Kitchen Garden (HH Plot)	
		Sub-Total	Washed Out Area	Inundated Area	Washed Out Area	Washed Out Area	Washed Out Area	Sub-Total	Washed Out Area	Inundated Area	Total			
Moskva	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qahramon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dashrigulo	910.41	670.58	52.46	618.12	877.42	0.00	0.00	239.83	24.81	215.02	19.89	1.13	18.76	0.00
Mehnatobod	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kalinin	525.75	391.36	34.77	356.60	0.00	0.00	0.00	134.39	16.49	117.90	23.80	1.36	22.44	0.00
Turdiev	608.29	428.08	61.65	366.43	580.92	0.00	0.00	180.21	40.70	139.51	3.67	0.21	3.46	0.00
Panjob	514.76	99.08	9.82	89.27	0.00	0.00	48.39	367.29	41.46	325.82	5.24	0.30	4.94	0.00
Chubek	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2,559.22	1,589.11	158.70	1,430.41	1,458.33	48.39	921.72	123.46	798.26	52.60	3.00	49.60	0.00	0.00

Sources: 1. Statistics on Land Use in Hamadoni District (List of Dehkan Farm), Hamadoni District.

2. Result of GIS.

3. Based on information from Hamadoni District.

4. Assumed based on Irrigation System Network Map together with Geographic Map arranged by GIS.

5. Assumed at based on a result of the Residents Consciousness Survey made by JICA Study Team, May, 2006.

Annex 9.2.2 Inundated Area by Land Use Category in Hamadoni in 10-Year Probable Flood
(as of 2007, ha)

A. General Land Use Balance and Inundated Area Caused by 10-Year-Flood

Jamoat	Arable (Agricultural) Area in Total ⁽¹⁾						Inundated Area		
	Total Area of Administrative Territory in Each Jamoat ⁽²⁾		Irrigated Area		Non-Irrigated Area		Washed Out Area in Total Agricultural Inundated Area		Irrigated Area ⁽³⁾
	Total	Of which: Cotton Field	Total	Inundated	Total ⁽²⁾	Built-Up Area ⁽²⁾	Total ⁽³⁾		
Moskva	327.95	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qahramon	4,152.53	2,505.00	1,615.00	382.00	2,887.00	0.00	0.00	0.00	0.00
Dashrigulo	3,630.97	2,280.00	1,548.00	38.00	2,318.00	973.30	19.89	247.15	80.92
Mehmatobod	6,244.77	1,320.00	1,079.50	160.00	1,480.00	0.00	0.00	0.00	0.00
Kalinin	2,582.26	1,610.00	1,092.00	147.00	1,757.00	573.55	25.72	160.28	53.41
Turdiev	3,093.36	1,675.00	1,009.00	0.00	1,675.00	699.97	3.72	156.41	117.15
Panjob	4,017.95	1,494.20	286.00	6.00	1,500.20	541.00	5.24	214.15	53.37
Chubek	23,974.10	1,389.00	655.00	725.00	2,114.00	0.00	0.00	0.00	0.00
Total	48,023.87	12,273.28	7,284.50	1,458.00	13,731.20	2,787.82	54.57	777.99	304.85

B. For Estimation of Damages to Agricultural Area (ha)

Jamoat	Irrigated Agricultural Area ⁽²⁾										Built-Up Area		
	Cotton Field			Influenced Cotton Field for Irrigation			Vine-Yard		Field for Other Vegetables		Inundated Area		
	Sub-Total	Washed Out Area	Inundated Area	Washed Out Area	Inundated Area	Water ⁽⁴⁾	Washed Out Area	Inundated Area	Sub-Total	Washed Out Area	Inundated Area	Floor Area of Houses in Total ⁽⁵⁾	Household Kitchen Garden (HH Plot)
Moskva	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qahramon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dashrigulo	953.41	702.26	54.94	647.32	845.74	845.74	0.00	251.16	25.98	225.18	19.89	1.13	18.76
Mehmatobod	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kalinin	547.83	407.80	36.23	371.57	0.00	0.00	0.00	140.03	17.18	122.85	25.72	1.47	24.25
Turdiev	696.25	489.98	70.57	419.41	519.02	519.02	0.00	206.27	46.58	159.69	3.72	0.21	3.51
Panjob	535.76	103.12	10.22	92.91	0.00	0.00	50.37	382.27	43.16	339.11	5.24	0.30	4.94
Chubek	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2,733.25	1,703.16	171.95	1,531.21	1,364.76	1,364.76	50.37	979.73	132.90	846.83	54.57	3.11	51.46

Sources: 1. Statistics on Land Use in Hamadoni District (List of Dehkan

Farm), Hamadoni District.

2. Result of GIS.

3. Based on information from Hamadoni District.

4. Assumed based on Irrigation System Network Map together with Geographic Map arranged by GIS.

5. Assumed at based on a result of the Residents Consciousness Survey made by JICA Study Team, May, 2006.

Annex 9.2.3 Inundated Area by Land Use Category in Hamadoni in 20-Year Probable Flood

A. General Land Use Balance and Inundated Area Caused by 20-Year-Flood (as of 2007, ha)

Jamoat	Arable (Agricultural) Area in Total ⁽¹⁾				Inundated Area			Washed Out Area in Total ⁽³⁾	Total ⁽³⁾	Irrigated Area ⁽³⁾	
	Total Area of Administrative Territory in Each Jamoat ⁽²⁾	Irrigated Area		Non-Irrigated Area	Total	Irrigated Agricultural Area ⁽²⁾	Built-Up Area ⁽²⁾				Total Agricultural Inundated Area
		Total	Of which: Cotton Field								
Moskva	327.95	0.07	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	
Qahramon	4,152.53	2,505.00	1,615.00	382.00	2,887.00	0.00	1,128.45	24.55	0.00	0.00	
Dashtigulo	3,630.97	2,280.00	1,548.00	38.00	2,318.00	1,313.30	1,282.73 *	30.58	332.51	108.87	
Mehnatobod	6,244.77	1,320.00	1,079.50	160.00	1,480.00	0.00	1,137.31	20.69	0.00	0.00	
Kalinin	2,582.26	1,610.00	1,092.00	147.00	1,757.00	1,175.55	1,105.13 *	70.42	323.34	107.74	
Turdiev	3,093.36	1,675.00	1,009.00	0.00	1,675.00	717.97	113.79	4.17	160.35	120.10	
Panjob	4,017.95	1,494.20	286.00	6.00	1,500.20	1,458.36	1,445.35	13.01	577.73	143.99	
Chubek	23,974.10	1,389.00	655.00	725.00	2,114.00	0.00	826.23	10.41	0.00	0.00	
Total	48,023.87	12,273.28	7,284.50	1,458.00	13,731.20	4,665.18	7,639.00	174.83	1,393.93	480.69	

B. For Estimation of Damages to Agricultural Area (ha)

Jamoat	Irrigated Agricultural Area ⁽²⁾										Built-Up Area	
	Total ⁽²⁾	Cotton Field		Influenced Cotton Field		Vine-Yard		Field for Other Vegetables		Total	Household Kitchen Garden (HH Plot)	
		Sub-Total	Washed Out Area	Inundated Area	for Irrigation Water ⁽⁴⁾	Washed Out Area	Washed Out Area	Sub-Total	Washed Out Area			Floor Area of Houses in Total ⁽⁵⁾
Moskva	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qahramon	1,128.45	727.53	0.00	727.53	177.49	0.00	400.93	0.00	400.93	0.00	0.00	0.00
Dashtigulo	1,282.73	944.82	73.91	870.90	603.18	0.00	337.91	34.95	302.96	30.58	1.74	28.83
Mehnatobod	1,137.31	930.10	0.00	930.10	29.88	0.00	207.21	0.00	207.21	0.00	0.00	0.00
Kalinin	1,105.13	822.64	73.08	749.57	80.81	0.00	282.49	34.66	247.82	70.42	4.02	66.40
Turdiev	713.79	502.33	72.35	429.98	506.67	0.00	211.47	47.75	163.71	4.17	0.24	3.94
Panjob	1,445.35	278.20	27.56	250.64	2.34	135.88	1,031.27	116.43	914.85	13.01	0.74	12.27
Chubek	826.23	389.62	0.00	389.62	79.61	0.00	436.61	0.00	436.61	0.00	0.00	0.00
Total	7,639.00	4,595.23	246.90	4,348.33	1,479.99	135.88	2,907.89	233.80	2,674.09	118.18	6.74	111.44

Remarks: 1. Level of influence for cotton field in **Qahramon** by irrigation wat 20%
2. Level of influence for cotton field in **Mehnatobod** by irrigation v 20%
3. Level of influence for cotton field in **Kalinin** by irrigation water: 30%
4. Level of influence for cotton field in **Panjob** by irrigation water: 30%
5. Level of influence for cotton field in **Chubek** by irrigation water: 30%

Sources: 1. Statistics on Land Use in Hamadoni District (List of Dehkan Farm), Hamadoni District.
2. Result of GIS.
3. Based on information from Hamadoni District.
4. Assumed based on Irrigation System Network Map together with Geographic Map arranged by GIS.
5. Assumed at based on a result of the Residents Consciousness Survey made by JICA Study Team, May, 2006.

Annex 9.2.4 Inundated Area by Land Use Category in Hamadoni in 30-Year Probable Flood

(as of 2007, ha)

Jamoat	Total Area of Administrative Territory in Each Jamoat ⁽²⁾	Arable (Agricultural) Area in Total ⁽¹⁾				Inundated Area			Washed Out Area in Total Agricultural Inundated Area	
		Irrigated Area		Non-Irrigated Area	Total ⁽²⁾	Irrigated Agricultural Area ⁽²⁾	Built-Up Area ⁽²⁾	Total ⁽³⁾	Irrigated Area ⁽³⁾	Total ⁽³⁾
		Total	Of which: Cotton Field in Total							
Moskva	327.95	0.07	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
Qahramon	4,152.53	2,505.00	1,615.00	382.00	2,887.00	1,165.00	1,139.44	25.56	0.00	0.00
Dashrigulo	3,630.97	2,280.00	1,548.00	38.00	2,318.00	1,331.30	1,300.65 *	30.65	337.16	110.39
Mehnatobod	6,244.77	1,320.00	1,079.50	160.00	1,480.00	1,163.00	1,142.31	20.69	0.00	0.00
Kalinin	2,582.26	1,610.00	1,092.00	147.00	1,757.00	1,181.55	1,109.23 *	72.32	324.54	108.14
Turdiev	3,093.36	1,675.00	1,009.00	0.00	1,675.00	725.97	721.79	4.17	162.15	121.45
Panjob	4,017.95	1,494.20	286.00	6.00	1,500.20	1,463.36	1,450.35	13.01	579.73	144.48
Chubek	23,974.10	1,389.00	655.00	725.00	2,114.00	850.64	838.69	11.95	0.00	0.00
Total	48,023.87	12,273.28	7,284.50	1,458.00	13,731.20	7,882.82	7,702.46	180.36	1,403.57	484.46

B. For Estimation of Damages to Agricultural Area

Jamoat	Total ⁽²⁾	Irrigated Agricultural Area ⁽²⁾										Built-Up Area	
		Cotton Field			Influenced Cotton Field for Irrigation		Vine-Yard		Field for Other Vegetables		Inundated Area		Household Kitchen Garden (HH Plot)
		Sub-Total	Washed Out Area	Inundated Area	Inundated Area	Water ⁽⁴⁾	Washed Out Area	Washed Out Area	Sub-Total	Washed Out Area	Inundated Area	Floor Area of Houses in Total ⁽⁵⁾	
Moskva	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qahramon	1,139.44	734.61	0.00	734.61	264.12	0.00	0.00	404.83	0.00	404.83	0.00	0.00	0.00
Dashrigulo	1,300.65	958.02	74.95	883.07	589.98	0.00	0.00	342.63	35.44	307.19	30.65	1.75	28.90
Mehnatobod	1,142.31	934.19	0.00	934.19	43.59	0.00	0.00	208.13	0.00	208.13	0.00	0.00	0.00
Kalinin	1,109.23	825.70	73.35	752.35	133.15	0.00	0.00	283.54	34.79	248.74	72.32	4.13	68.19
Turdiev	721.79	507.96	73.16	434.80	501.04	0.00	0.00	213.84	48.29	165.55	4.17	0.24	3.94
Panjob	1,450.35	279.16	27.66	251.51	3.42	136.35	0.00	1,034.84	116.83	918.01	13.01	0.74	12.27
Chubek	838.69	395.49	0.00	395.49	129.75	0.00	0.00	443.19	0.00	443.19	0.00	0.00	0.00
Total	7,702.47	4,635.13	249.11	4,386.02	1,665.06	136.35	0.00	2,930.99	235.35	2,695.64	120.15	6.85	113.30

Remarks: 1. Level of influence for cotton field in **Qahramon** by irrigation water 30%
2. Level of influence for cotton field in **Mehnatobod** by irrigation water 30%
3. Level of influence for cotton field in **Kalinin** by irrigation water: 50%
4. Level of influence for cotton field in **Panjob** by irrigation water: 50%
5. Level of influence for cotton field in **Chubek** by irrigation water: 50%

Sources: 1. Statistics on Land Use in Hamadoni District (List of Dehkan Farm), Hamadoni District.
2. Result of GIS.
3. Based on information from Hamadoni District.
4. Assumed based on Irrigation System Network Map together with Geographic Map arranged by GIS.
5. Assumed at based on a result of the Residents Consciousness Survey made by JICA Study Team, May, 2006.

Annex 9.2.5 Inundated Area by Land Use Category in Hamadoni in 50-Year Probable Flood

A. General Land Use Balance and Inundated Area Caused by 50-Year-Flood (as of 2007, ha)

Jamoat	Total Area of Administrative Territory in Each Jamoat ⁽²⁾	Arable (Agricultural) Area in Total ⁽¹⁾				Inundated Area			Washed Out Area in Total Agricultural Inundated Area	
		Irrigated Area		Non-Irrigated Area	Irrigated Agricultural Area ⁽²⁾	Built-Up Area ⁽²⁾	Irrigated Area ⁽³⁾			
		Total	Of which: Cotton Field in Total							
Moskva	327.95	0.07	0.00	0.00	0.00	3.00	0.07	2.93	0.00	0.00
Qahramon	4,152.53	2,505.00	1,615.00	382.00	2,887.00	1,218.00	1,192.44	25.56	0.00	0.00
Dashrigulo	3,630.97	2,280.00	1,548.00	38.00	2,318.00	1,349.30	1,318.55 *	30.75	341.80	111.91
Mehnatobod	6,244.77	1,320.00	1,079.50	160.00	1,480.00	1,183.00	1,162.29	20.71	0.00	0.00
Kalinin	2,582.26	1,610.00	1,092.00	147.00	1,757.00	1,201.55	1,128.63 *	72.93	330.21	110.03
Turdiev	3,093.36	1,675.00	1,009.00	0.00	1,675.00	736.97	732.79	4.17	164.62	123.30
Panjob	4,017.95	1,494.20	286.00	6.00	1,500.20	1,476.00	1,462.35	13.65	584.53	145.68
Chubek	23,974.10	1,389.00	655.00	725.00	2,114.00	897.00	866.87	30.13	0.00	0.00
Total	48,023.87	12,273.28	7,284.50	1,458.00	13,731.20	8,064.82	7,863.99	200.83	1,421.15	490.92

B. For Estimation of Damages to Agricultural Area

Jamoat	Total ⁽²⁾	Irrigated Agricultural Area ⁽²⁾										Built-Up Area	
		Cotton Field		Influenced Cotton Field for Irrigation		Vine-Yard		Field for Other Vegetables		Inundated Area		Household Kitchen Garden (HH Plot)	
		Sub-Total	Washed Out Area	Inundated Area	Water ⁽⁴⁾	Washed Out Area	Washed Out Area	Sub-Total	Washed Out Area	Inundated Area	Floor Area of Houses in Total ⁽⁵⁾		
Moskva	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	
Qahramon	1,192.44	768.78	0.00	768.78	423.11	0.00	0.00	423.66	0.00	423.66	0.00	0.00	
Dashrigulo	1,318.55	971.21	75.98	895.23	576.79	0.00	0.00	347.35	35.93	311.42	30.75	29.00	
Mehnatobod	1,162.29	950.52	0.00	950.52	64.49	0.00	0.00	211.77	0.00	211.77	0.00	0.00	
Kalinin	1,128.63	840.13	74.63	765.50	251.87	0.00	0.00	288.49	35.40	253.09	72.93	68.77	
Turdiev	732.79	515.70	74.27	441.43	493.30	0.00	0.00	217.09	49.02	168.07	4.17	3.94	
Panjob	1,462.35	281.47	27.88	253.59	4.53	0.00	0.00	1,043.40	117.80	925.61	13.65	12.87	
Chubek	866.87	408.78	0.00	408.78	246.22	0.00	0.00	458.09	0.00	458.09	0.00	0.00	
Total	7,863.99	4,736.60	252.77	4,483.83	2,060.30	137.47	2,989.92	238.15	2,751.77	121.50	6.93	114.57	

Remarks: 1. Level of influence for cotton field in **Qahramon** by irrigation water 50%

2. Level of influence for cotton field in **Mehnatobod** by irrigation water 50%

3. Level of influence for cotton field in **Kalinin** by irrigation water: 100%

4. Level of influence for cotton field in **Panjob** by irrigation water: 100%

5. Level of influence for cotton field in **Chubek** by irrigation water: 100%

Sources: 1. Statistics on Land Use in Hamadoni District (List of Dehkan Farm), Hamadoni District.

2. Result of GIS.

3. Based on information from Hamadoni District.

4. Assumed based on Irrigation System Network Map together with Geographic Map arranged by GIS.

5. Assumed at based on a result of the Residents Consciousness Survey made by JICA Study Team, May, 2006.

Annex 9.2.6 Inundated Area by Land Use Category in Hamadoni in 100-Year Probable Flood

A. General Land Use Balance and Inundated Area Caused by 100-Year-Flood (as of 2007, ha)

Jamoat	Arable (Agricultural) Area in Total ⁽¹⁾				Inundated Area			Washed Out Area in Total Agricultural Inundated Area ⁽³⁾
	Total Area of Administrative Territory in Each Jamoat ⁽²⁾	Irrigated Area		Non-Irrigated Area	Total	Irrigated Agricultural Area ⁽²⁾	Built-Up Area ⁽²⁾	
		Total	Of which: Cotton Field					
Moskva	327.95	0.07	0.00	0.00	3.00	0.07	2.93	0.00
Qahramon	4,152.53	2,505.00	1,615.00	382.00	2,887.00	1,324.10	28.90	0.00
Dashtigulo	3,630.97	2,280.00	1,548.00	38.00	2,318.00	1,331.55 *	30.75	345.17
Mehnatobod	6,244.77	1,320.00	1,079.50	160.00	1,480.00	1,182.91	23.09	0.00
Kalinin	2,582.26	1,610.00	1,092.00	147.00	1,757.00	1,151.63 *	72.93	336.94
Turdiev	3,093.36	1,675.00	1,009.00	0.00	1,675.00	732.79	4.17	164.62
Panjob	4,017.95	1,494.20	286.00	6.00	1,500.20	1,494.20	15.16	597.26
Chubek	23,974.10	1,389.00	655.00	725.00	2,114.00	875.91	31.73	0.00
Total	48,023.87	12,273.28	7,284.50	1,458.00	13,731.20	8,093.18	209.64	1,443.98

B. For Estimation of Damages to Agricultural Area (ha)

Jamoat	Irrigated Agricultural Area ⁽²⁾										Built-Up Area	
	Total ⁽²⁾	Cotton Field		Influenced Cotton Field		Vine-Yard		Field for Other Vegetables		Total	Household Kitchen Garden (HH Plot)	
		Sub-Total	Washed Out Area	Inundated Area	for Irrigation Water ⁽⁴⁾	Washed Out Area	Washed Out Area	Sub-Total	Washed Out Area			
Moskva	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	
Qahramon	1,324.10	853.66	0.00	853.66	380.67	0.00	470.44	0.00	470.44	0.00	0.00	
Dashtigulo	1,331.55	980.78	76.73	904.05	567.22	0.00	350.77	36.28	314.49	30.75	29.00	
Mehnatobod	1,182.91	967.39	0.00	967.39	56.05	0.00	215.52	0.00	215.52	0.00	0.00	
Kalinin	1,151.63	857.25	76.15	781.10	234.75	0.00	294.37	36.12	258.25	72.93	68.77	
Turdiev	732.79	515.70	74.27	441.43	493.30	0.00	217.09	49.02	168.07	4.17	3.94	
Panjob	1,494.20	286.00	28.49	257.51	0.00	148.87	1,059.34	120.36	938.98	15.16	14.29	
Chubek	875.91	413.05	0.00	413.05	241.95	0.00	462.86	0.00	462.86	0.00	0.00	
Total	8,093.18	4,873.83	2,55.64	4,618.19	1,973.94	148.87	3,070.48	241.79	2,828.69	123.01	115.99	

Remarks: 1. Level of influence for cotton field in **Qahramon** by irrigation water: 50%
2. Level of influence for cotton field in **Mehnatobod** by irrigation water: 50%
3. Level of influence for cotton field in **Kalinin** by irrigation water: 100%
4. Level of influence for cotton field in **Panjob** by irrigation water: 100%
5. Level of influence for cotton field in **Chubek** by irrigation water: 100%

Sources: 1. Statistics on Land Use in Hamadoni District (List of Dehkan Farm), Hamadoni District.
2. Result of GIS.
3. Based on information from Hamadoni District.
4. Assumed based on Irrigation System Network Map together with Geographic Map arranged by GIS.
5. Assumed at based on a result of the Residents Consciousness Survey made by JICA Study Team, May, 2006.

Annex 9.2.7 Economic Cost Estimates for the Project

Description	Short Term Works												Sub-Total of Short Term									
	2009						2010						2011		2013							
	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total							
Grand Total of All the Terms																						
Cost for Civil Works	120,433	21,611	142,043	1,409	11	1,420	943	8	952	15,608	2,682	18,290	15,608	2,682	18,290	20,806	3,575	24,381	54,373	8,959	63,332	
Engineering Fee (Cost for Consulting Services)	2,645	12,281	14,926	213	1,508	1,720	227	870	1,098	227	870	1,098	303	1,160	1,463	303	1,160	1,463	1,183	5,916	0	580
Administration Cost	1,106	0	1,106	132	0	132	132	0	132	95	0	95	95	0	95	127	0	127	580	0	580	
Physical Contingency	2,463	587	3,050	0	0	0	0	0	0	318	71	389	318	71	389	424	95	519	1,061	237	1,298	
Value Added Tax (VAT)	31,170	0	31,170	22	0	22	22	0	22	3,971	0	3,971	3,971	0	3,971	5,295	0	5,295	13,282	0	13,282	
Sub-Total (Net Financial Project Cost)	157,816	34,478	192,294	1,775	1,519	3,294	1,310	1,516	2,826	20,220	3,623	23,843	20,220	3,623	23,843	26,955	4,830	31,785	70,479	15,112	85,591	
Price Contingency	27,535	368	27,903	180	15	196	145	15	161	2,452	37	2,489	2,680	38	2,718	3,904	51	3,955	9,362	157	9,519	
Financial Cost in Total (Incl. Price Contingency)	185,351	34,846	220,197	1,955	1,534	3,490	1,455	1,532	2,987	22,672	3,661	26,332	22,899	3,661	26,560	30,860	4,881	35,741	79,841	15,269	95,110	
Economic Cost in Total	173,635	34,471	208,106	1,569	1,519	3,088	1,121	1,516	2,637	15,535	3,555	19,091	15,535	3,555	19,091	20,710	4,739	25,449	89,203	15,425	104,628	
Operation and Maintenance Cost:																						
Financial Cost for Operation and Maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Economic Cost for Operation and Maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Description	Medium/Long Term Works												Sub-Total of Medium/Long Term											
	2014						2015						2016						2017		2018		2019	
	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total			
Cost for Civil Works	0	0	0	13,212	2,530	15,742	13,212	2,530	15,742	13,212	2,530	15,742	13,212	2,530	15,742	13,212	2,530	15,742	66,059	12,652	78,711			
Engineering Fee (Cost for Consulting Services)	210	1,543	1,753	250	964	1,215	250	964	1,215	250	964	1,215	250	964	1,215	250	964	1,215	1,462	6,364	7,827			
Administration Cost	132	0	132	79	0	79	79	0	79	79	0	79	79	0	79	79	0	79	79	0	79			
Physical Contingency	0	0	0	280	70	350	280	70	350	280	70	350	280	70	350	280	70	350	350	1,402	350			
Value Added Tax (VAT)	19	0	19	3,574	0	3,574	3,574	0	3,574	3,574	0	3,574	3,574	0	3,574	3,574	0	3,574	17,888	0	17,888			
Sub-Total (Net Financial Project Cost)	360	1,543	1,903	17,395	3,565	20,960	17,395	3,565	20,960	17,395	3,565	20,960	17,395	3,565	20,960	17,395	3,565	20,960	87,337	19,366	106,703			
Price Contingency	57	16	73	3,010	38	3,048	3,289	39	3,328	3,595	39	3,634	3,929	39	3,968	4,294	40	4,333	18,173	211	18,384			
Financial Cost in Total (Incl. Price Contingency)	417	1,560	1,977	20,405	3,603	24,008	20,684	3,603	24,288	20,990	3,604	24,594	21,324	3,604	24,928	21,689	3,604	25,293	105,510	19,578	125,087			
Economic Cost in Total	212	1,543	1,755	15,873	3,500	19,374	16,315	3,500	19,816	16,799	3,500	20,300	17,327	3,500	20,828	17,905	3,500	21,406	84,452	19,046	103,478			
Operation and Maintenance Cost:																								
Financial Cost for Operation and Maintenance	30	0	30	30	0	30	30	0	30	30	0	30	30	0	30	30	0	30	30	0	30			
Economic Cost for Operation and Maintenance	24	0	24	24	0	24	24	0	24	24	0	24	24	0	24	24	0	24	24	0	24			

Remarks:

- Cost for Civil Works consist of costs for (1) Labor, (2) Equipment and Materials together with (3) Profit of Contractors of 15 %, (4) Physical Contingency (Cost for Reserve) of 2 %, and (5) Payment for Social Security for Personnel of 25 %.
- Accordingly, for converting financial cost into economic cost, following matters should be taken into consideration to the total amount in each year:
 - Profit of Contractors: 5.00% of the cost for civil works. The original words can be translated as "contractors' expense". But, it may be considered as "profit" in this case.
 - Share rate of Labors: 4.25% of the cost for civil works after deduction of the profit of contractors. Remainings of 95.75 % are for the costs for the equipment and materials.
 - Shadow Wage Rate: 85.33% of the cost for labor.
 - Social Security (Insurance): 25.00% of the labor cost. Original words can be translated as "the fund for social protection". It means as "social insurance" or "social security". It is not paid for workers directly, but kept as a fund for security. It is considered as a transfer item. In Engineering Fees, it should be taken into account for Local Currency Portion (LC Portion).
 - Standard Conversion Factor: 0.98658 based on the statistics of international trade and national revenue.
 - Administration Cost: 0.50% of the cost for civil works after deduction of the profit of contractors.
 - Physical Contingency (Reserve): 2.00% of the cost for civil works after deduction of the profit of contractors as a reserve.
 - Personal Income Tax: Contractors- 8.00% of the costs for labor as a minimum rate by the wage rate of 100 TJIS per month. Consultants- 13.00% of the costs for engineering fees in LC.
 - Corporate Profit Tax: 20.00% of the net profit of the contractors.
 - Value Added Tax: 20.00% of the total cost of civil works, engineering and administration costs, and physical cost in financial terms in construction stage. But, in detailed design stage, it does not included because that detailed design stage is served by foreign consultants. Anyway, it should be deducted in the economic terms.
- Price Contingency: Counted in the financial cost, but it should be excluded in the economic cost.
 - Local Currency Portion (LC): 9.29% based on the average increasing rate of consumer price index (CPI).
 - Foreign Currency Portion (FC): 1.00% according to the similar project in the developing countries based on the Japanese CPI issued by the Japan Bank (Japanese National Bank).

After completion of the works:

Financial Cost for Operation and Maintenance	30	0	30	30	0	30	30	0	30	30	0	30	30	0	30	30	0	30	30	0	30
Economic Cost for Operation and Maintenance	24	0	24	24	0	24	24	0	24	24	0	24	24	0	24	24	0	24	24	0	24

Sector 9
Economics & Finance

Annex 9.2.8 Economic Evaluation in the Works for Short Term Plan

Year in Order	Calendar Year	Economic Cost			Econo- mic Benefit	Cash Balance
		Const- ruction Cost	OM Cost	Total		
-1	2007	0	0	0	0	0
0	2008	0	0	0	0	0
1	2009	3,088	0	3,088	0	-3,088
2	2010	2,637	0	2,637	0	-2,637
3	2011	19,091	0	19,091	0	-19,091
4	2012	19,091	0	19,091	0	-19,091
5	2013	25,449	0	25,449	0	-25,449
6	2014	0	24	24	15,727	15,702
7	2015	0	24	24	15,727	15,702
8	2016		24	24	15,727	15,702
9	2017		24	24	15,727	15,702
10	2018		24	24	15,727	15,702
11	2019		24	24	15,727	15,702
12	2020		24	24	15,727	15,702
13	2021		24	24	15,727	15,702
14	2022		24	24	15,727	15,702
15	2023		24	24	15,727	15,702
16	2024		24	24	15,727	15,702
17	2025		24	24	15,727	15,702
18	2026		24	24	15,727	15,702
19	2027		24	24	15,727	15,702
20	2028		24	24	15,727	15,702
21	2029		24	24	15,727	15,702
22	2030		24	24	15,727	15,702
23	2031		24	24	15,727	15,702
24	2032		24	24	15,727	15,702
25	2033		24	24	15,727	15,702
26	2034		24	24	15,727	15,702
27	2035		24	24	15,727	15,702
28	2036		24	24	15,727	15,702
29	2037		24	24	15,727	15,702
30	2038		24	24	15,727	15,702
31	2039		24	24	15,727	15,702
32	2040		24	24	15,727	15,702
33	2041		24	24	15,727	15,702
34	2042		24	24	15,727	15,702
35	2043		24	24	15,727	15,702
36	2044		24	24	15,727	15,702
37	2045		24	24	15,727	15,702
38	2046		24	24	15,727	15,702
39	2047		24	24	15,727	15,702
40	2048		24	24	15,727	15,702
41	2049		24	24	15,727	15,702
42	2050		24	24	15,727	15,702
43	2051		24	24	15,727	15,702
44	2052		24	24	15,727	15,702
45	2053		24	24	15,727	15,702
46	2054		24	24	15,727	15,702
47	2055		24	24	15,727	15,702
48	2056		24	24	15,727	15,702
49	2057		24	24	15,727	15,702
50	2058		24	24	15,727	15,702
51	2059		24	24	15,727	15,702
52	2060		24	24	15,727	15,702
53	2061		24	24	15,727	15,702
54	2062		24	24	15,727	15,702
55	2063		24	24	15,727	15,702
56	2064		24	24	15,727	15,702
57	2065		24	24	15,727	15,702
Total		69,356	1,267	70,624	817,786	747,162
Present Value at the discount rate of 10%:						
Net Present Value (NPV)				39,935	80,134	40,199
EIRR						18.41%
B/C Ratio						2.01

Annex 9.2.9

Economic Evaluation in the Works for Medium/Long Term Plan

Year in Order	Calendar Year	Economic Cost			Econo- mic Benefit	Cash Balance
		Const- ruction Cost	OM Cost	Total		
-1	2,007	0	0	0	0	0
0	2,008	0	0	0	0	0
1	2,009	3,088	0	3,088	0	-3,088
2	2,010	2,637	0	2,637	0	-2,637
3	2,011	19,091	0	19,091	0	-19,091
4	2,012	19,091	0	19,091	0	-19,091
5	2,013	25,449	0	25,449	0	-25,449
6	2,014	1,755	24	1,779	15,727	13,947
7	2,015	19,374	24	19,398	15,727	-3,671
8	2,016	19,816	24	19,840	15,727	-4,114
9	2,017	20,300	24	20,324	15,727	-4,597
10	2,018	20,828	24	20,852	15,727	-5,126
11	2,019	21,406	24	21,430	15,727	-5,703
12	2,020	0	56	56	18,307	18,251
13	2,021	0	56	56	18,307	18,251
14	2,022		56	56	18,307	18,251
15	2,023		56	56	18,307	18,251
16	2,024		56	56	18,307	18,251
17	2,025		56	56	18,307	18,251
18	2,026		56	56	18,307	18,251
19	2,027		56	56	18,307	18,251
20	2,028		56	56	18,307	18,251
21	2,029		56	56	18,307	18,251
22	2,030		56	56	18,307	18,251
23	2,031		56	56	18,307	18,251
24	2,032		56	56	18,307	18,251
25	2,033		56	56	18,307	18,251
26	2,034		56	56	18,307	18,251
27	2,035		56	56	18,307	18,251
28	2,036		56	56	18,307	18,251
29	2,037		56	56	18,307	18,251
30	2,038		56	56	18,307	18,251
31	2,039		56	56	18,307	18,251
32	2,040		56	56	18,307	18,251
33	2,041		56	56	18,307	18,251
34	2,042		56	56	18,307	18,251
35	2,043		56	56	18,307	18,251
36	2,044		56	56	18,307	18,251
37	2,045		56	56	18,307	18,251
38	2,046		56	56	18,307	18,251
39	2,047		56	56	18,307	18,251
40	2,048		56	56	18,307	18,251
41	2,049		56	56	18,307	18,251
42	2,050		56	56	18,307	18,251
43	2,051		56	56	18,307	18,251
44	2,052		56	56	18,307	18,251
45	2,053		56	56	18,307	18,251
46	2,054		56	56	18,307	18,251
47	2,055		56	56	18,307	18,251
48	2,056		56	56	18,307	18,251
49	2,057		56	56	18,307	18,251
50	2,058		56	56	18,307	18,251
51	2,059		56	56	18,307	18,251
52	2,060		56	56	18,307	18,251
53	2,061		56	56	18,307	18,251
54	2,062		56	56	18,307	18,251
55	2,063		56	56	18,307	18,251
56	2,064		56	56	18,307	18,251
57	2,065		56	56	18,307	18,251
58	2,066		56	56	18,307	18,251
59	2,067		56	56	18,307	18,251
60	2,068		56	56	18,307	18,251
61	2,069		56	56	18,307	18,251
Total		172,834	2,940	175,773	1,009,703	833,930
Present Value at the discount rate of 10%:						
				76,653	87,725	11,072
EIRR						11.59%
B/C Ratio						1.14

**SECTOR 10 PILOT PROJECT ON
LOCAL COMMUNICATION
NETWORK FOR DISASTER
MANAGEMENT IN RAYON
HAMADONI**

SUPPORTING REPORT

**SECTOR 10 PILOT PROJECT ON LOCAL COMMUNICATION
NETWORK FOR DISASTER MANAGEMENT IN
RAYON HAMADONI**

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SECTOR 10. PILOT PROJECT ON LOCAL COMMUNICATION NETWORK FOR DISASTER MANAGEMENT IN HAMADONI

10.1 BACKGROUND OF THE PILOT PROJECT

Based on the results of the questionnaire survey on the 2005 Flood damage in the first fiscal year of the Study, the Flood-Evacuation Drill in the second fiscal year (Sector 8) and other related investigations, several challenges for local communication network system for flood disaster management in Hamadoni are clearly identified.

- There are ambiguities of communication procedures between Jamoat and Kishlak. Rayon Hamadoni (population: about 120 thousand) consists of 8 Jamoats (population: around 10 – 20 thousand, respectively) including 4 snow-melting flood disaster prone Jamoats. Each Jamoat (except Jamoat Moskva) has 5 – 20 Kishlaks. When the Chairman of Hamadoni declares the evacuation warning, Jamoat Offices have responsibilities to disseminate the evacuation warning to Kishlaks in the Jamoat. At the Flood-Evacuation Map Exercise, mobile phones, verbal communication (by sending a messenger), etc. were given as means of communication, however, it became clear that a communication network system about who will transfer to whom and how (including transportation device) had not been concretely established. A list of telephone numbers of the key persons in emergency situations did not exist either. There would be a tendency that the experience of the 2005 flood (no casualties despite the insufficient communication) are overestimated and hinder the improvement of current ambiguous situations.
- There are ambiguities of communication procedures between Kishlak and Mahalla. There are totally around 60 Kishlaks in Rayon Hamadoni. About 20 of 60 Kishlaks are identified as snow-melting flood disaster prone areas. Each Kishlak has several hundreds to thousands population and consists of a number of Mahallas. When the evacuation warning is disseminated, the Head of Kishlak will be informed from the Jamoat Office (as described above paragraph). The Head of Kishlak has a responsibility to transfer the evacuation warning to residents through the Head of Mahalla. However, the communication network between Kishlak and Mahalla also remains ambiguous on the procedures about who will transfer to whom and how.
- Support System for Vulnerable People is ambiguous. Because of military conscription or working outside of Tajikistan, etc., considerable numbers of males in rural areas in Hamadoni are away from home for long periods. It inevitably results that the elders, females, children become the majority. Some troubles of vehicles (out of order, lack of fuel, etc.) were also reported. Consequently, the support system for the people who need to be supported at evacuation is ambiguous.
- The Patrol Team Management System is ambiguous. The monitoring of dikes and canals by the Patrol Team is essential for the early warning system on flood disaster management. However, there is no clear cooperation on the arrangement for the Patrol Team among CoES, MMWR, Hukumat of Hamadoni and other related organizations. The transportation devices are not secured either.

On the basis of the above-mentioned situations of the communication network system, the Pilot Project on Local Communication Network for Disaster Management in Rayon Hamadoni (hereafter, Network-PP) was conducted.

10.2 OUTLINE OF THE PILOT PROJECT

10.2.1 Objectives

Major objectives of the Network-PP are as follows:

- Implementation of support and guidance to local municipalities for establishment of framework in order to share the flood information correctly and immediately among

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Hukumat of Hamadoni, Jamoat Offices, self-governance communities and local residents

- Implementation of support and guidance to local municipalities and self-governance communities for development of the communication network of Hukumat of Hamadoni – Jamoat Office – Kishlak – Mahalla, based on their self-reliant efforts
- Implementation of support and guidance to local municipalities and self-governance communities for verification and, if needed, improvement of the communication network through the support to conduction of the network communication drill

10.2.2 Contents of the Support and Guidance

Concrete contents of the support and guidance are as follows:

- Concrete consideration about a necessary communication network for flood disaster management and evacuation activities
- Electronic documentation of considered communication network (Development of the communication network)
- Setting of the lent equipments and training of how to use them
- Network communication drill using the communication network system
- Monitoring of the flood-fighting activities

1) Consideration about a Necessary Communication Network to Implement Flood Disaster Management and Evacuation Activities Timely and Appropriately

Assignment of the key persons for flood warning communication network system and development of their contact list are implemented in the flood disaster prone Jamoats including their Kishlaks and Mahallas. Besides, concrete routes, transportation devices, transportation time, etc. for flood warning dissemination from Jamoat Office to where (to whom) in each Kishlak are also considered through arranging the messenger teams. The same communication system is also considered between each Kishlak and their Mahallas. The support and guidance for both systems put emphasis on clarifying where the responsibility lies and the concrete action procedures. The lent PC which will be set in the Hukumat of Hamadoni is utilized for the management (modifying, updating and printing) of the list. The guidance to assigned staff for list-developing work is also conducted.

In the flood season, the JICA Study Team supports the arrangement of Patrol Teams for monitoring the dikes and canals. Their monitoring results are recorded / reported as Current Situation Reports (CSR), based on the guidance. Besides, the support and guidance to Hukumat of Hamadoni for sharing the information based on the CSR among Jamoat Offices, residents and other related organizations, are conducted.

2) Electronic Documentation of Considered Communication Network (Development of the Communication Network)

The communication network system is documented electronically, and then distributed to persons in charge of communication in each organization, as necessary. The lent PC which will be set in the Hukumat of Hamadoni is utilized for the management (modifying, updating and printing) of the electronic documents. The procedures of organizing are as follows:

a) Communication Network System

A communication network system from the Hukumat of Hamadoni to local residents through subsidiary organizations should be organized. The contents of the system are as follows:

i) Clarification of Responsibilities

The name of persons in charge communications and how to get in touch with them are documented.

ii) Formation of the Messenger Teams

The Messenger Teams for information dissemination to subsidiary organizations are formed. The name of messenger, responsible areas and correspondence procedures are described.

Administrative Units in Tajikistan

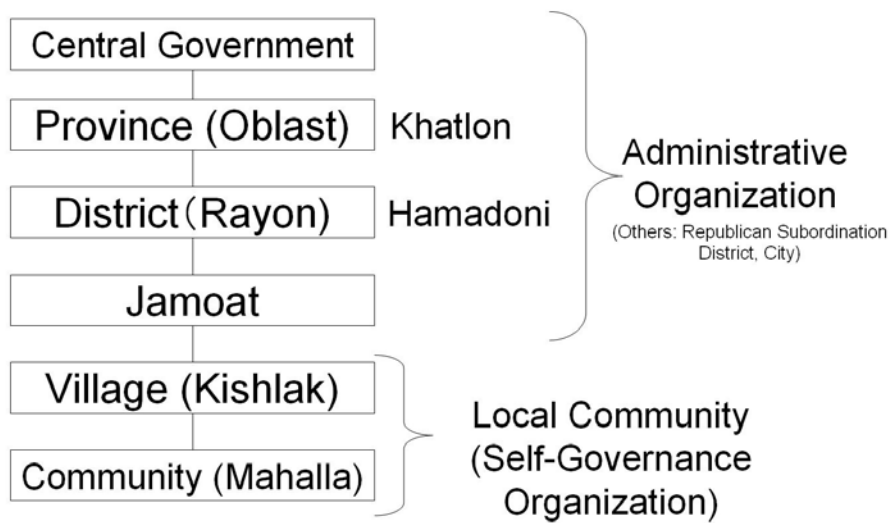


Fig. R 10.2.1 Administrative Units in Tajikistan

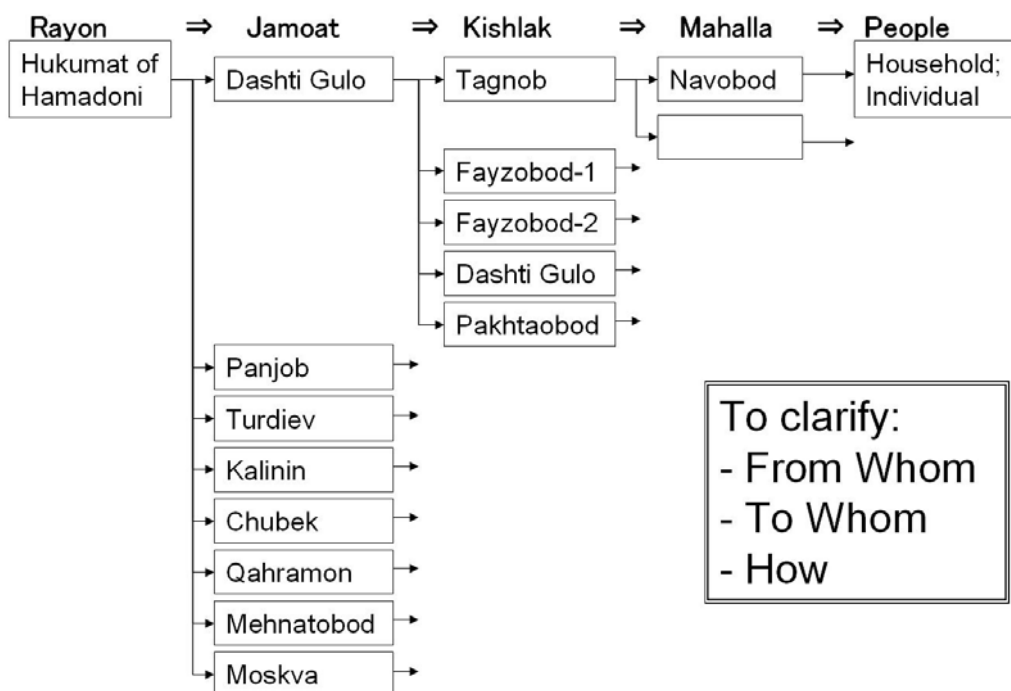


Fig. R 10.2.2 Conceptual Diagram of Communication Network System in Hamadoni

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b) Support System for Vulnerable People in Flood Evacuation

Lists for the people who need to be supported in flood evacuation are developed in each Mahalla, the smallest unit of community, including the supporters at evacuations.

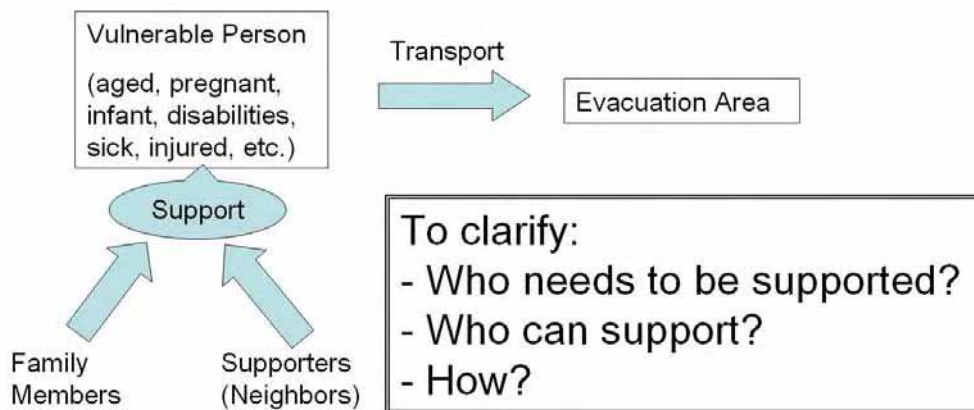


Fig. R 10.2.3 Conceptual Diagram of Support System for Vulnerable People in Flood Evacuation

c) Arrangement of Equipments

Regarding the VHF radios and Hand Sirens which were lent to the persons in charge of disaster management in Hamadoni, the responsible persons for management are clearly assigned based on the communication network system.

d) Uniform management of the information

The management for information about the communication network system is unified by the deputy chairman (in charge of emergency situations) in the Hukumat of Hamadoni. The lent PC which will be set in the Hukumat of Hamadoni is utilized for the management (modifying, updating and printing) of the information. The information sharing with other subsidiary organizations, CoES Local Headquarters in Hamadoni, and other related organizations is carried out using printed documents.

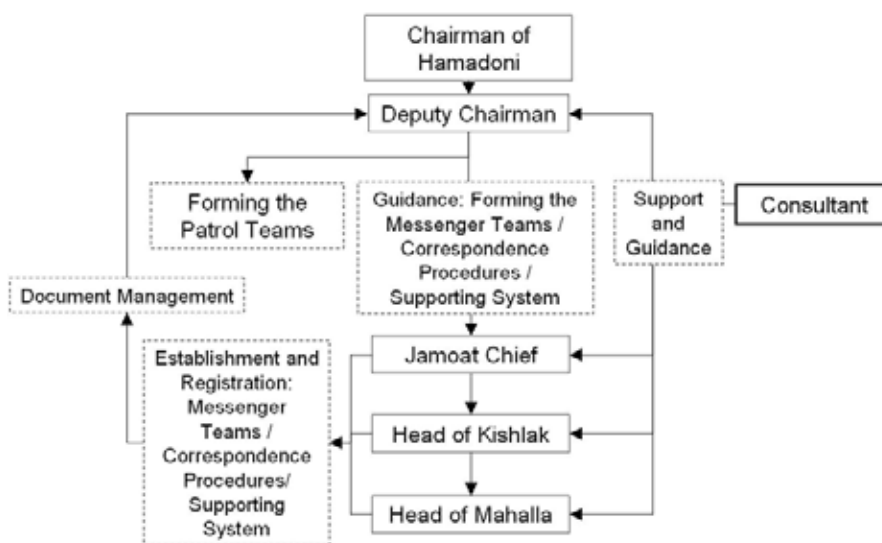


Fig. R 10.2.4 Conceptual Diagram of the Pilot Project Implementation

3) Explanation about the necessary activities to the responsible persons in the communication network system and arrangement of necessary equipments

VHF radios are lent to the persons in charge of disaster management in Hamadoni to aim an establishment of the communication network system for emergency situations at the suitable timing after the beginning of the flood season. An arrangement of Hand Sirens is decided after the discussion among the local responsible persons. The explanations to the responsible persons are conducted in advance in order to confirm objectives and necessary activities.

4) Network Communication Drill

a) Outlines of the Drill

A network communication drill for disseminating a flood-evacuation warning is conducted along an assigned model line of network communication (Patrol Team -> Hukumat of Hamadoni -> Jamoat Office -> Kishlak -> Mahalla) under the condition of mobile phone disabilities. It is reviewed that: the Patrol Team for dike monitoring reports a CSR to the Hukumat of Hamadoni by VHF radio, the messenger team of the Hukumat of Hamadoni transfers the evacuation warning to the Jamoat Office, the messenger teams of the Jamoat Office transfers the evacuation warning to the Kishlak, the messenger teams of Kishlak transfers the evacuation warning to Mahalla, information sharing of the evacuation warning among the local residents in the Mahalla, respectively. A map exercise targeting the representatives is conducted in advance of the drill. The procedures of information dissemination through the deputy, in case of the absence of the regular staff, are also checked at the map exercise.

The target area of the network communication drill is assigned through discussions among the persons in charge of the emergency situations in Hamadoni.

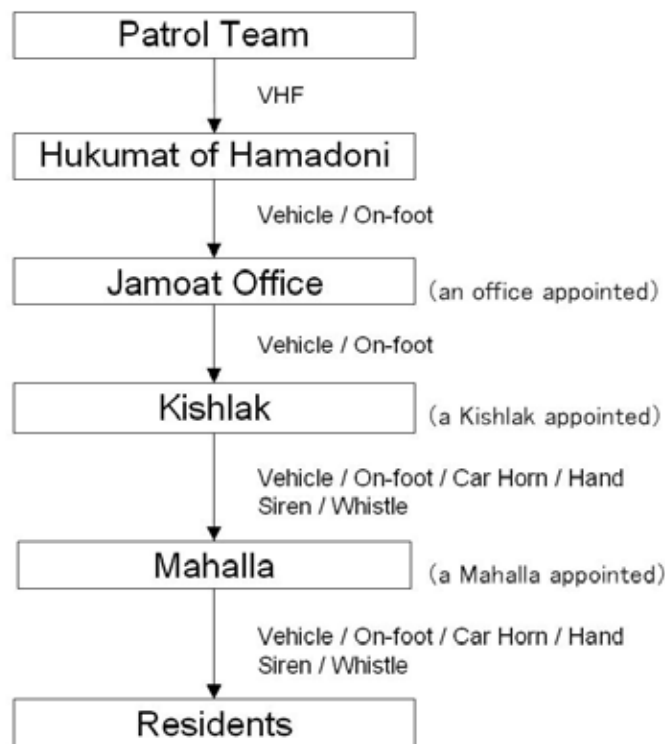


Fig. R 10.2.5 Conceptual Diagram of the Network Communication Drill

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b) Planned Schedule of the Network Communication Drill

The network communication drill is planned as a three-day schedule including preliminary and evaluation meetings. On the first day, a preliminary meeting for representatives including a map exercise is planned. The network communication drill on the second day and an evaluation meeting with representatives on the third day are also planned.

5) Monitoring of the flood-fighting activities

Based on the communication network system established through the above 1) – 3), it is placed on alert in Hamadoni during the flood season. The performance of the communication network system will be testified when an actual flood event occurs. Then the improvement measure for the identified problems will be taken, if needed. The network communication drill described in above 4) will be implemented one time if there is no flood, and then the same procedures of verification and improvement will be conducted.

The JICA Study Team monitors the situation of the Patrol Team activities and information sharing in Hamadoni at least one time in a week until any flood occurs. The improvement measure will be taken if problems are identified through the results of the monitoring. The distribution and utilization of the contact list are also monitored.

10.2.3 Expected Outcomes

The 5 levels of the communication network should be work in order to disseminate flood warnings in Hamadoni: Patrol Teams - Hukumat of Hamadoni, Hukumat of Hamadoni – Jamoat Offices, Jamoat Office – Head of Kishlak, Head of Kishlak – Head of Mahalla, Head of Mahalla – Residents. In this pilot project, “from whom”, “to whom”, and “how” in each levels are clarified by the responsible person of each organization. The information is integrated at the Hukumat of Hamadoni and electronically documented as database.

The support system for vulnerable people in flood evacuation is also clarified “from whom”, “to whom”, and “how” in community level, gathering the information through the Head of Mahalla. This system corresponds to a mutual assistance of the three types of disaster management activities (self-help, mutual assistance, public aid). An efficient evacuation support will be expected even if the upper stream part of the communication network does not work.

Printed survey forms are distributed to responsible persons in each organization in order to gather the above both information. Their hand-written answers are collected and documented electronically. The electronic documentation will be expected to help information sharing (copying, distribution) and updating efficiently.

Eventually, the discussion among the persons in charge of disaster management and local residents is essential for an establishment of this kind of communication network system. The establishment activities with discussions will be expected to raise the all stakeholders’ awareness on disaster management.

10.3 ESTABLISHMENT OF THE COMMUNICATION NETWORK SYSTEM

10.3.1 Between the Hukumat of Hamadoni and Jamoat Offices

The responsible persons for emergency communication between the Hukumat of Hamadoni and Jamoat Offices were assigned for all eight Jamoats. The members of the messenger teams from the Hukumat of Hamadoni to Jamoat Offices were identified. Contact address and mobile phone number (if available) of responsible persons in each Jamoat Office were also clarified.

10.3.2 Between Jamoat Offices and Kishlaks

All eight Jamoats submitted the information about the communication network system between the Jamoat Office and their Kishlaks. The achievement ratios (number of Kishlaks with information on the communication network system / total number of Kishlaks) of each Jamoat are shown in the table below.

Table R 10.3.1 Achievement Ratio of Communication Network System between Jamoat Offices and Kishlaks

Jamoat	Total Number of Kishlak	Number of Kishlak which Established Jamoat - Kishlak Network	Progress (%)
Dashti Gulo	5	5	100
Kalinin	5	5	100
Turdiyev	5	5	100
Panjob	5	5	100
Qahramon	9	9	100
Mehnatobod	7	7	100
Chubek	21	19	90
Moskva	-	-	-

Jamoat Moskva has no Kishlak because it is the capital of the Rayon Hamadoni. Except 2 Kishlaks in Chubek, other all Kishlaks established the communication network in emergency situations between Jamoat and Kishlak.

10.3.3 Between Kishlaks and Mahallas

The reported number of Mahallas with the communication network between each Kishlak and the Mahallas are indicated on the table below. The achievement ratios (number of Mahallas with information on the communication network system / total number of Mahallas) in each Jamoat are shown in the table below.

Table R 10.3.2 Achievement Ratio of Communication Network System between Kishlak and Mahallas

Jamoat	Total Number of Mahalla	Number of Mahalla which Established the Kishlak - Mahalla Network	Progress (%)
Dashti Gulo	29	29	100
Kalinin	32	30	94
Turdiyev	24	23	96
Panjob	26	25	96
Qahramon	28	28	100
Mehnatobod	30	30	100
Chubek	35	16	46
Moskva	40	31	78

The 4 flood prone Jamoats (Dashti Gulo, Kalinin, Turdiyev, Panjob) show averagely 96.5% of achievement ratio.

10.4 ESTABLISHMENT OF THE SUPPORT SYSTEM FOR VULNERABLE PEOPLE IN FLOOD EVACUATION

This information was requested to each Head of Mahalla through Jamoat Office and Head of Kishlak. The six of eight Jamoat submitted the information: Dashti Gulo, Kalinin, Turdiyev,

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Panjob, Qahramon and Mehnatobod. Moskva and Chubek have not submitted the information. The achievement ratios in each Jamoat and number of vulnerable people / supporters in each Kishlak are shown in the tables below.

Table R 10.4.1 Achievement Ratio of Support System for Vulnerable People in Flood Evacuation

Jamoat	Total Number of Kishlak	Number of Kishlak which Established the Support System	Progress (%)
Dashti Gulo	5	3	60
Kalinin	5	5	100
Turdiev	5	5	100
Panjob	5	5	100
Qahramon	9	6	67
Mehnatobod	7	5	71

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Table R 10.4.2 Number of Vulnerable People and Supporters in Kishlaks

Jamoat	Kishlak	Number of Vulnerable Persons	Number of Supporters
Dashti Gulo	Fayzobod-1	57	111
	Fayzobod-2	50	99
	Tagnob	5	9
	Dashti Gulo		
	Pakhtaobod		
	subtotal	112	219
Kalinin	Anjirkon	60	39
	Safedob	72	144
	Kodara-1	45	90
	Kodara-2	60	120
	Safarov Gadoi	208	407
	subtotal	445	800
Turdiev	Metintugay	12	24
	Sovetobod	8	16
	Sayyod	7	14
	Iqbol	5	10
	Beshkappa	5	10
	subtotal	37	74
Panjob	Sayrob	118	236
	Chorbogh	28	56
	Panjob	9	18
	Tokiston	4	8
	Zafarobod	34	68
	subtotal	193	386
Qahramon	Darai Kalot	2	4
	Margob	1	2
	Pakhtakor		
	Pushkin	2	4
	Guliston	2	4
	Tagi Namak	3	6
	Sadbargo		
	Qahramon	1	2
	Boghi Buz		
	subtotal	11	22
Mehnatobod	Mehnatobod	5	10
	Gulobod	3	6
	Dusti	4	8
	Guliston	3	6
	Navobod	4	8
	Arpatuguldi		
	Olimtoy		
	subtotal	19	38
total		817	1539

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10.5 NETWORK COMMUNICATION DRILL

A network communication drill (hereafter, the Drill) was carried out by CoES Headquarters in Dushanbe, Local Headquarters in Kulyab, Local Headquarters in Hamadoni and Hukumat of Hamadoni with support of the JICA Study Team. In CoES Headquarters in Dushanbe, the international cooperation department, operational department, communication center, and other concerned sections were involved to promote the Drill.

10.5.1 Objectives

The major objectives of the Drill are:

- Checking the communication procedures in emergency situations in Hamadoni
- Measuring the time of the decision making in Hukumat of Hamadoni from when the Patrol Team sends a Current Situation Report (CSR)
- Measuring the time of information dissemination from the Hukumat of Hamadoni to local residents in Mahalla, along the communication network
- Through the experience of preparing and conducting the Drill, the problems and their improvement measures will be discussed, if needed.

10.5.2 Time and Date

Based on the discussions with the related organizations of disaster management in Hamadoni, considering the beginning of a new school year on 1 September and the progress of the agricultural work in cotton fields (the most major production in Hamadoni), a preliminary meeting (including a map exercise) on 28 August, the field drill on 29 August, and an evaluation meeting on 30 August were decided.

The meetings and Drill are conducted during early morning because people are usually busy for cotton field in the daytime

10.5.3 Test Site

The target areas are Kishlak Metintugay and Mahalla Sarhadchi in Jamoat Turdiev. Metintugay is one of the affected areas at the 2005 flood. Sarhadchi is located on the south end of Metintugay and nearest to the main canal. Sarhadchi is a flood disaster prone section in a densely-populated Kishlak. Therefore, Sarhadchi is suitable for the target area of the Drill as a typical area where an immediate evacuation action just after the flood evacuation warning is desired.

The number of households and population of Metintugay are 640 and 6276 respectively (as of 1 January 2007). The number of households and population of Sarhadchi are approximately 20 and 180 respectively.

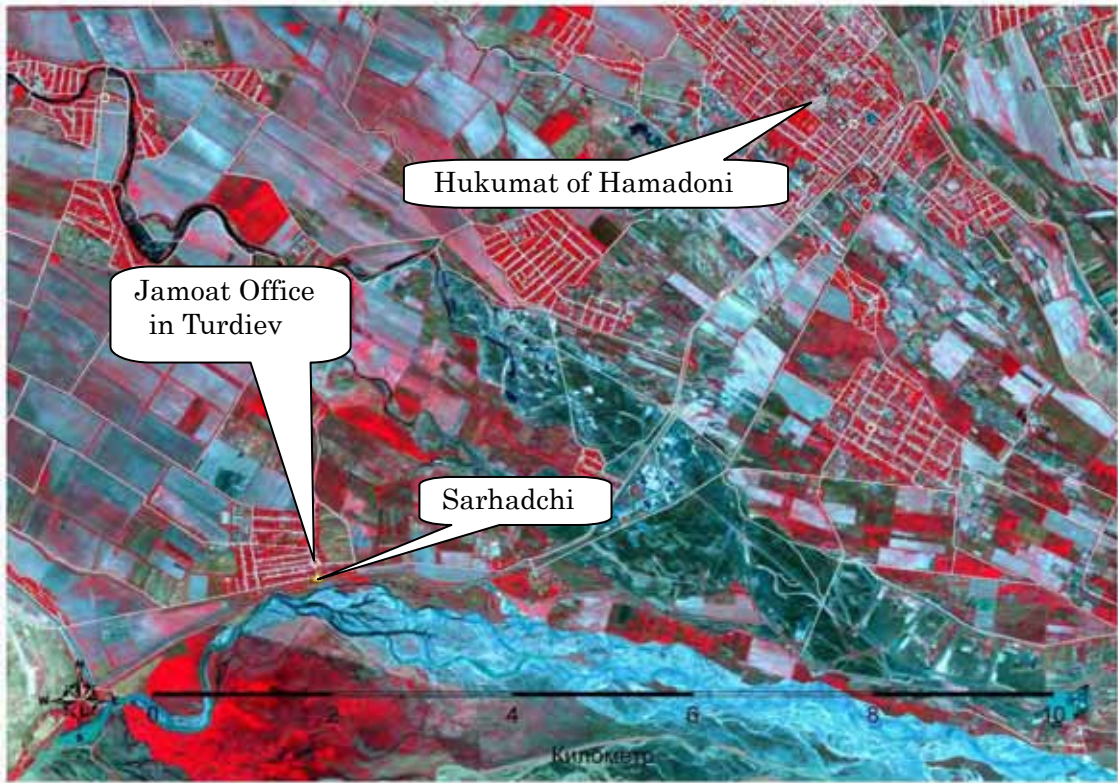


Fig. R 10.5.1 Locations of Hukumat of Hamadoni, Jamoat Office in Turdiev, Sarhadchi



Fig. R 10.5.2 Locations of Sarhadchi (yellow square) and the meeting area of Sarhadchi (yellow triangle) in Metintugay

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10.5.4 Implementation Procedures

The situation of the Drill is assumed that VHF radios, land line phones and mobile phones are not available except the VHF radios between the Patrol Team and Hukumat of Hamadoni.

During the Drill, times for several actions are measured.

- Measure the time of the decision making in Hukumat of Hamadoni from when the Patrol Team for dike monitoring on the border zone sends a Current Situation Report on a critical level.
- Measure the time of the information dissemination from the Hukumat of Hamadoni to local residents in a Mahalla, through an appointed line of the network.
- Measure the time until the residents gather at a meeting area with important documents (passport, birth certificate, etc.) in the Mahalla. (Not move to an evacuation area.)

A schematic diagram of the network communication drill is as follows:

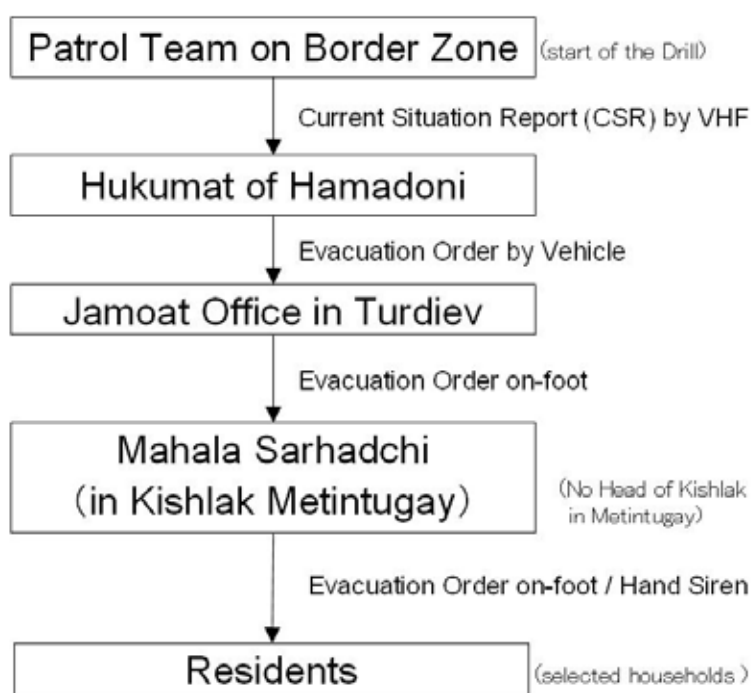


Fig. R 10.5.3 Diagram of the Network Communication Drill on 29 August 2007

10.5.5 Public Relations Activities

Newsletters in Tajiki were issued in order to share the significance, procedures and results of the Drill. Each volume was distributed about 280: all household in Sarhadchi (20), each Mahalla in Hamadoni (approx. 250), Jamoat Offices (8), Hukumat of Hamadoni (1), CoES Local Headquarters in Hamadoni (1), etc. The newsletter was printed in an A4 size paper in both sides. The date of issues and contents are as follows:

Vol.5 (11 August 2007) Outline of the Network-PP

Vol.6 (24 August 2007) Implementation procedures and the scenario of the Drill

Vol.7 (21 September 2007) Results of the Drill and the WG seminar

10.5.6 Preliminary Meeting and Map Exercise

On 28 August 2007, a preliminary meeting targeting the representatives in charge of emergency situations in Hamadoni was conducted at the boardroom of the Hukumat of Hamadoni. The participants were Hukumat of Hamadoni, Jamoat Offices, CoES Headquarters, CoES Zonal Headquarters in Kulyab, CoES Local Headquarters in Hamadoni, and Representative of Sarhadchi. The participants checked procedures of emergency communication and simulated them on the map along the scenario during the map exercise. The scenario is shown below.

Table R 10.5.1 Scenario of the Map Exercise and the Network Communication Drill

#	Expected Time	General Situation	Player	Action
1	7:30	All participants start deploying.	All	Patrol Team: the dike on the border zone Officials: the office room Head of Kishlak, Head of Mahalla: home? Residents: home
2	7:55	All participants get ready.	All	All participants get ready at each place.
3	8:00	The Patrol Team sends a Current Situation Report to the Hukumat of Hamadoni.	Patrol Team	The PT submits a CSR "The dike at XX km (location) is eroded seriously, soon to breach." to the Hukumat of Hamadoni by VHF radio.
4	8:02	An emergency situation is declared by the chairman of the Hukumat of Hamadoni.	Hukumat of Hamadoni / Rayon Headquarters for Emergency Situations	1. The duty staff receives the CSR, and then reports it to the Chairman of Hamadoni. 2. The Chairman declares the Critical Level Flood Warning for stating evacuation and the Rayon HQ for ES is established. 3. A messenger is assigned to inform the Jamoat Office about the evacuation order.
5	8:04	The messenger of the Hukumat of Hamadoni moves to the Jamoat Office by vehicle.	Messenger of Hukumat of Hamadoni	The messenger of the Hukumat of Hamadoni starts to the Jamoat Office by vehicle.
6	8:25	The messenger of the Hukumat of Hamadoni arrives at the Jamoat Office.	Jamoat Office	1. The Jamoat Chief receives the evacuation order from the Hukumat of Hamadoni. 2. The Jamoat Chief orders a messenger to go to the Head of Mahalla.
7	8:27	The messenger of the Jamoat Office moves to the Head of Mahalla on foot.	Messenger of Jamoat Office	The messenger of the Jamoat Office starts to the Head of Mahalla on foot.
8	8:33	The messenger of the Jamoat Office arrives at the Head of Mahalla.	Head of Mahalla	The Head of Mahalla receives the evacuation order.
9	8:35	The Head of Mahalla starts disseminating the evacuation order to local residents.	Head of Mahalla	The Head of Mahalla disseminates the evacuation order to local residents through verbal communications, car horn, hand sirens, whistles, etc..
10	8:40	The residents start moving to the meeting area in the Mahalla	Residents	After informed the evacuation order from the Head of Mahalla, the residents take their important documents (passport, birth certificate, etc.) and move to the meeting area in the Mahalla.
11	8:50	The residents get together at the meeting area in the Mahalla	Head of Mahalla, Residents	The Head of Mahalla counts the number of the residents in the meeting area to confirm that all local participants get together.
12	9:00	The evaluation meeting is started.	All	Evaluation and Discussion: 1. What is the problem for information dissemination? 2. How to improve? 3. Who has responsibility?
13	9:30	The evaluation meeting is finished.	All	

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Fig. R 10.5.4 Map Exercise in the Preliminary Meeting on 28 August 2007

10.5.7 Monitoring Results of the Drill

From the start to finish, it took around 50 minutes. The monitoring results of the Drill on 29 August 2007 are shown in the table below.

Table R 10.5.2 Monitoring Results of the Network Communication Drill

TIME	SITUATION	REMARKS
8:00	A duty staff of Hukumat of Hamadoni received a CSR from the Patrol Team on the dike through VHF radio: "The dike is eroded seriously and facing to breach soon". Then, the duty staff made an information sheet for reporting to the Deputy Chairman.	A duty staff stands ready to communicate through VHF base on the second floor of the Hukumat of Hamadoni.
8:04	The duty staff reported to the Deputy Chairman of Hukumat of Hamadoni about the CSR.	The office of the deputy chairman is the innermost room on the first (ground) floor of the Hukumat of Hamadoni.
8:08	Deputy Chairman prepared and signed an evacuation order.	
8:10	A messenger started for the Jamoat Office in Turdiev by car	
8:30	A messenger arrived at the Jamoat Office in Turdiev and informed the evacuation order to a representative of the Jamoat Office	
8:32	A messenger of the Jamoat Office started for the house of the Deputy Head of Mahalla Sarhadchi on foot.	Head of Sarhadchi was in bad shape.
8:36	Deputy Head of Sarhadchi received the evacuation order from the messenger at his house.	
8:38	Deputy Head of Sarhadchi began to disseminate the evacuation order to residents using Hand Siren. The residents began to move.	8 of 20 households were selected to participate in the Drill in advance.
8:45	The residents arrived at the meeting area. Deputy Head of Sarhadchi began to count the number of residents.	
8:50	Deputy Head of Sarhadchi reported to CoES Kulyab that 61 people got together.	

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Fig. R 10.5.5 The Patrol Team on dike with VHF Handie-Talkie



Fig. R 10.5.6 Receipt of the CSR by VHF Base in Hukumat of Hamadoni



Fig. R 10.5.7 Signing for the evacuation order

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Fig. R 10.5.8 A car-messenger from the Hukumat of Hamadoni



Fig. R 10.5.9 Receipt of the evacuation order at Jamoat Office in Turdiev



Fig. R 10.5.10 An on-foot messenger from Jamoat Office

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Fig. R 10.5.11 Receipt of the evacuation order at Sarhadchi



Fig. R 10.5.12 Dissemination of the evacuation order using Hand Siren



Fig. R 10.5.13 Counting the number of gathered residents

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10.5.8 Evaluation Meeting with the Residents

An Evaluation Meeting with the Local Residents was conducted just after the Drill on 29 August 2007

1) Time and Date

08:50 – 09:10, Wednesday 29 August 2007

2) Venue

Meeting area in Sarhadchi

3) Participants

Regarding the local residents in Sarhadchi, totally 61 people from 8 of 20 households, mainly consisting of women and children, participated in the Drill and the evaluation meeting. The Hukumat of Hamadoni, Jamoat Offices, Deputy Head of Mahalla Sarhadchi, CoES Headquarters in Dushanbe, CoES Zonal Headquarters in Kulyab, and CoES Local Headquarters in Hamadoni were also participated in the Drill and the evaluation meeting in Sarhadchi.

4) Summary of Discussions

a) Strong awareness of the local residents' flood evacuation

The residents in Sarhadchi know their evacuation routes and areas (Sayyod Hill) clearly. So, the timing, when the evacuation will start, is a next challenge. Evacuation should be completed before the flood water arrives at Sarhadchi.

b) Well Preparedness

People in Sarhadchi understood the objective and contents of the Network-PP and the Drill through the explanation by the Representative of Mahalla and the newsletters Vol.5 and 6 in advance.

c) Recognition of flood early warning levels

The JICA Study Team explained that, in the Master Plan, an evacuation preparation warning is planned to disseminate to residents before the evacuation order, in order to make evacuations efficiently. The evacuation preparation warning will be disseminated among the residents through verbal communication, etc. Hand Siren is used for only an immediate evacuation order.

d) Hand Siren as evacuation order dissemination tool

Through the experience of the Drill, people became to recognize the sound of Hand Siren as an evacuation order.

e) Support for the people with hearing difficulties

Some households have family members with hearing difficulties. The other family members will inform those vulnerable persons about an evacuation order.

f) Clearness of information

If the information makes confusion, people should ask the Head of Mahalla / Kishlak or Jamoat Office for endorsement and clarification.

g) Transportation in evacuation

Transportation in evacuation is also a major challenge.



Fig. R 10.5.14 Evaluation Meeting with the Residents in Sarhadchi

10.5.9 Evaluation Meeting with the Representatives

1) Time and Date

08:30-10:20, Thursday, 30 August 2007

2) Venue

Boardroom, 1st floor of the Annex Building, Hukumat of Hamadoni

3) Participants

Hukumat of Hamadoni, Jamoat Offices (Turdiev, Dashti Gulo, Kalinin, Qahramon), Deputy Head of Sarhadchi, CoES Headquarters in Dushanbe, CoES Zonal Headquarters in Kulyab, CoES Local Headquarters in Hamadoni, Mission East, Caritas

4) Summary of Discussions

a) Avoiding battery depletion of VHF Handie-Talkies

The battery depletion was identified just before the Patrol Team was willing to move to the dike yesterday. Eventually the Patrol Team brought another VHF Handie-Talkie. The battery charging of VHF Handie-Talkie should be completed before starting the flood fighting activities. The manual of VHF Handie-Talkie should indicate this point clearly to raise awareness of the users. The manual will be prepared by the JICA Study Team. The management of VHF radios including battery charging should be supervised by the CoES Local Headquarters in Hamadoni after handing over.

b) Involving responsible persons

The messenger from the Hukumat of Hamadoni has been changed to another staff just before the beginning of the Drill yesterday. So the actual messenger did not participate in the Drill. Once in a while, some of responsible persons in charge of emergency situation can not participate in drills because a flood season is also a cotton season. Aiming to involve responsible persons into flood management drills, it might be considered to hold the drills in before or after the flood season / cotton season. The suitable date of implementation of the drills should be coordinated by the Hukumat of Hamadoni.

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c) Well-organized local residents

The activities of the local residents in Sarhadchi were well organized. They gathered smoothly at the meeting area with passports or birth certificates immediately after the dissemination of the evacuation order by Hand Siren. It took about 7 minutes from the dissemination to getting together. Sarhadchi is located along the street with about 900 meters and the meeting area is seated at the end of the street.

d) Security and medical service

At the evacuation drill, there are possibilities of injuries or thefts. Providing against such cases, the police department and medical service team should be participated in the drill. The coordination of their participations should be carried out by Hukumat of Hamadoni because the chairman or deputy chairman in charge of emergency situations / civil defense can involve those organizations in emergency situations.

e) Endorsement of information

Unsupported rumors will cause misleading activities of the people. The information should be endorsed by official staff. Hukumat of Hamadoni, Jamoat Offices, Head of Community (Kishlak, Mahalla) and CoES Local headquarters are responsible to disseminate accurate information about flood warning.

f) Patrol Team

The local residents who live near canals, Jamoat Offices, Hukumat of Hamadoni, CoES and MMWR should collaborate as the Patrol Teams. Involvement of engineers of MMWR into the Patrol Teams is essential, especially for dike monitoring.

g) Drills in other areas

Several areas in Hamadoni have less experience of flood than Sarhadchi. So the trainings or drills in those areas are important for efficient evacuation activities.

h) Hydrological post for measuring water level in Hamadoni

Not only Khirmanjo, a water level monitoring post along the Pyanj River in Hamadoni is important. The Master Plan includes a hydrological post in Chubek and it should be managed by Agency on Hydrometeorology. (Several gauging posts (with CODAN) along Surkhob River and Yakhsu River are managed by Agency on Hydrometeorology with supports of NGO in Kulyab.) Those observation results should be shared among all stakeholders.



Fig. R 10.5.15 Evaluation Meeting with the Representatives

10.5.10 Summary of the Network Communication Drill

Through the network communication drill, the participants recognized that:

- Communication Procedures among Patrol Team, Hukumat of Hamadoni, Jamoat Office, Kishlak, Mahalla, and Residents are concretely reviewed and familiarized.
- VHF Handie-Talkie for Patrol Team and Hand Siren for warning dissemination are useful.
- The establishment of Patrol Teams for monitoring dikes / canals in collaboration with CoES, Hukumat of Hamadoni, Jamoat Office, Residents and MMWR is essential.

10.6 SUMMARY OF THE PILOT PROJECT

The Pilot Project on Local Communication Network for Disaster Management in Rayon Hamadoni achieved as follows:

- Clarification of an emergency communication network between the Hukumat of Hamadoni and local residents was carried out.
- Electronic documentation was introduced as a part of technical transfer.
- Facilitation of maintenance and information sharing were achieved.

The master data are shared among Hukumat of Hamadoni, CoES and other related organizations by both electronic data and print-out files.

Based on the experience of preparedness and implementation of the Pilot Project, several approaches in the future are recommended as follows:

- Updating of data on the communication network system and the support system for vulnerable people in flood evacuation
- Conduction of drills in other areas in Hamadoni
- Conduction of drills in before-flood season as well as during flood season
- Establishing the Patrol Teams for dike / canal monitoring during flood season under the cooperation and coordination among all stakeholders

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REFERENCES

1. List of population and household of Kishlaks in Hamadoni (as of 1 January 2007, Statistical Committee in Hamadoni)

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ANNEXES



Newsletter
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The Study on Natural Disaster Prevention in Pyanj River



Vol.5, 11 August 2007

Pilot Project on Information Dissemination Network

Based on the experiences and discussions at the Flood Evacuation Drill in last May in Hamadoni, it came to light that there were several ambiguities in the present information dissemination network from the Hukumat of Hamadoni to local residents. The contact addresses of responsible persons in charge of flood evacuation and communication tools (how to contact) are not shared among the stakeholders. For this reason, the CoES and the JICA Study Team decide to conduct a pilot project (P/P) on improvement for Information Dissemination Network in Hamadoni, in cooperation with the Hukumat of Hamadoni and other responsible persons.



Разъяснить:
- От Кого
- Кому
- Как

The main objective of the P/P is clarification of the existing network for three issues: “From whom”, “To whom” and “How” between each organizations. The Study Team prepared survey forms about the information and asked the Hukumat of Hamadoni, Jamoat Offices and Heads of Kishlaks and Mahalas (small community unit) to fulfill the form. Each organization is also requested to assign at least three contact persons with priority in case a representative is not available.

Кишлак-Махалла-Жители

Дата: # _____

Отв. лицо	Должность	Телефон	Адрес	Средство связи	Приоритет
Председатель махаллы	1				
Человек ответственный за МС	2				
Человек ответственный за МС	3				
Председатель махаллы	1				
Человек ответственный за МС	2				
Человек ответственный за МС	3				
Председатель махаллы	1				
Человек ответственный за МС	2				
Человек ответственный за МС	3				

Callouts in the image:

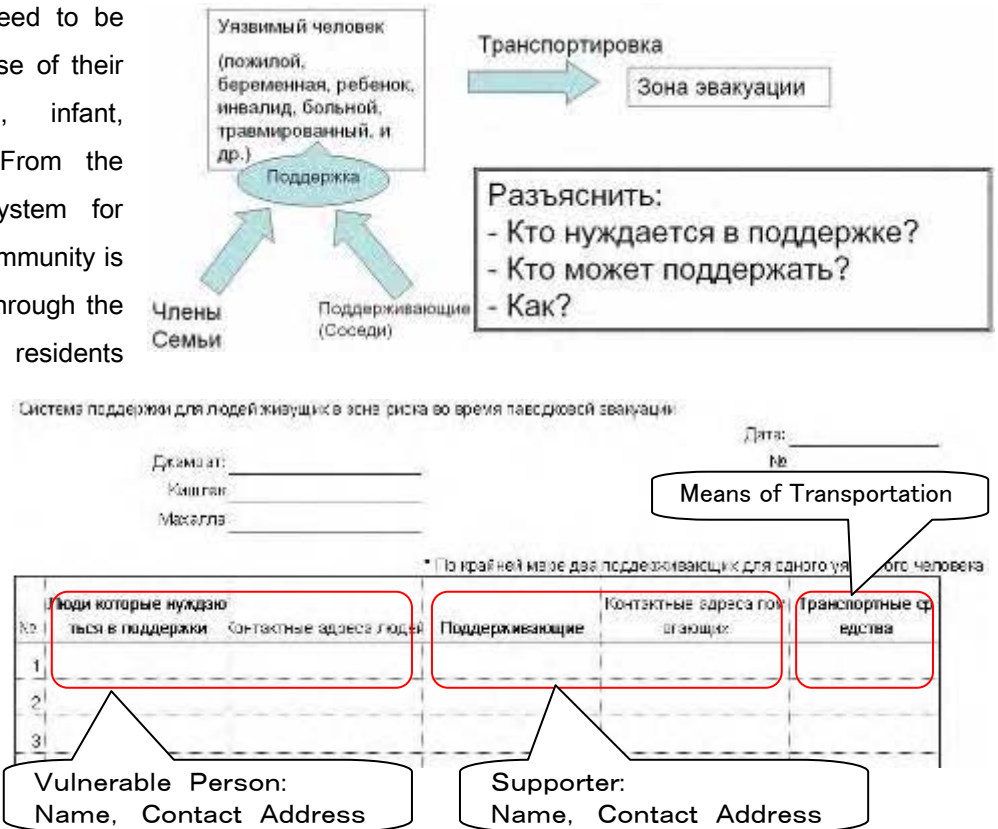
- Telephone (lined, mobile)
- Name of Mahala
- Priority
- Telephone (lined, mobile)
- Address
- Responsible person in the Kishlak
- Responsible person in each Mahala
- Communication method from the Kishlak to Mahalas
- Communication method to share among the Residents in the Mahala

Sample of survey forms for Information Dissemination Network P/P (Kishlak-Mahala-Residents)

Support System for Vulnerable Parsons

At evacuation, some people need to be supported for transportation because of their vulnerabilities (aged, pregnant, infant, disabilities, sick, injured, etc.). From the viewpoint of this, a support system for vulnerable persons in each local community is considered as a part of the P/P. Through the establishment of support system, residents can clarify “Who need to be supported?”, “Who can support?” and “How?”, as mutual assistance.

The survey forms were distributed to the Heads of Mahalas in mainly flood prone area. At least two supporters for one vulnerable person are recommended in case that a supporter is not available.



Exercise on Information Dissemination

A small-scale exercise on Information Dissemination (without actual evacuation) is planned on 28-30 August at a target area in Hamadoni. This exercise will concentrate on procedures of information dissemination along a line from Hukumat of Hamadoni, a Jamoat Office, a Kishlak, a Mahala, and residents. The target area is assigned in advance. The objectives of the exercise are:

- 1) check the procedures of information dissemination,
- 2) check the time from the Hukumat of Hamadoni to residents.

Sharing the results

The results of P/P will be shared among all responsible staff in charge of emergency situations in Hamadoni: CoES including the Local Headquarters in Kulyab as well as the Local Headquarters in Hamadoni, Hukumat of Hamadoni, Jamoat Chiefs, Head and responsible persons of Kishlaks and Mahalas, and other concerned organizations, through digital files or printouts. The maintenance, upgrade and reissue of the Information Dissemination Network will also continued by themselves.

For a better tomorrow for all.

THE STUDY ON NATURAL DISASTER PREVENTION IN PYANJ RIVER IN THE REPUBLIC OF TAJIKISTAN

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Newsletter on The Study on Natural Disaster Prevention in Pyanj River



Vol.6, 24 August 2007

Outline of the Information Dissemination Exercise

The CoES, the Hukumat of Hamadoni, JICA Study Team and other concerned organizations will conduct an Information Dissemination Exercise on 29 August 2007, as a part of the Pilot Project. The target area is Mahala Sarhadchi of Kishlak Metintugay, Jamoat Turdiev. An evaluation meeting of all participants including residents and officials is also planned on the same day just after the Exercise.

Date & Time

07:30-09:30, Wednesday, 29 August, 2007

Venue

Dike on the border zone, Hukumat of Hamadoni, Jamoat Office in Turdiev, Mahala Sarhadchi (Kishlak Metintugay)

Objective

- (1) Check and evaluate the Information Dissemination Procedures in Rayon Hamadoni
- (2) Measuring the time of the decision making in Hukumat of Hamadoni from when the Patrol Team for dike monitoring on the border zone sends a Current Situation Report on a critical level.
- (3) Measuring the time of the information dissemination from the Hukumat of Hamadoni to local residents in a Mahala, through an appointed line of the network.

Participants

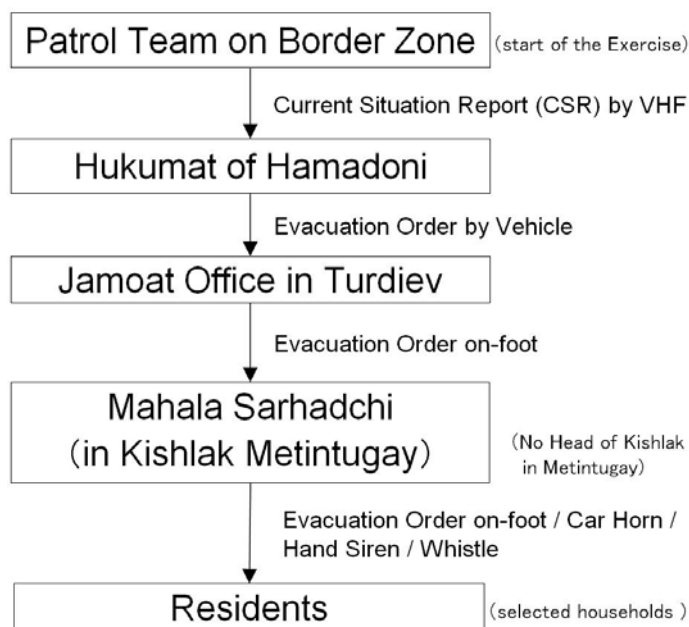
Hukumat of Hamadoni, Jamoat Office in Turdiev, Head of Mahala Sarhadchi, Residents in Mahala Sarhadchi (selected in advance), CoES, JICA Study Team and other concerned organizations

Contents

- (1) Measuring the time of the information dissemination from the Hukumat of Hamadoni to local residents in a Mahala.
- (2) Assume the situation that VHF radios, land line phones and mobile phones are not available.
- (3) Timing until the residents gather at a meeting area with important documents (passport, birth certificate, etc.) in the Mahala. (Not move to an evacuation area.)
- (4) The targeted households (residents) are previously selected by the head of Mahala Sarhadchi. Approximately 8 of 20 households.
- (5) An evaluation meeting with all participants after the Exercise will be held at the meeting area in the Mahala Sarhadchi. The evaluation points are: i) What is the problem for information dissemination?, ii) How to improve?, and iii) Who has responsibility?

Preparatory Meeting and Evaluation meeting for representatives in charge of emergency situations

A preparatory meeting for official staff is planned on 28 August, the day before the Exercise. An evaluation meeting for official staff also planned on 30 August, the day after the Exercise.



Scenario for the Information Dissemination Exercise on 29 August 2007

#	Expected Time	General Situation	Player	Action
1	7:30	All participants start deploying.	All	Patrol Team: the dike on the border zone Officials: the office room Head of Kishlak, Head of Mahala: home? Residents: home?
2	7:55	All participants get ready.	All	All participants get ready at each place.
3	8:00	The Patrol Team sends a Current Situation Report to the Hukumat of Hamadoni.	Patrol Team	The PT submits a CSR "The dike at XX km (location) is eroded seriously, soon to breach." to the Hukumat of Hamadoni by VHF radio.
4	8:02	An emergency situation is declared by the chairman of the Hukumat of Hamadoni.	Hukumat of Hamadoni / Rayon Headquarters for Emergency Situations	1. The duty staff receives the CSR, then reports it to the Chairman of Hamadoni. 2. The Chairman declares the Critical Level Flood Warning for stating evacuation and the Rayon HQ for ES is established. 3. A messenger is assigned to inform the Jamoat Office about the evacuation order.
5	8:04	The messenger of the Hukumat of Hamadoni moves to the Jamoat Office by vehicle.	Messenger of Hukumat of Hamadoni	The messenger of the Hukumat of Hamadoni starts to the Jamoat Office by vehicle.
6	8:25	The messenger of the Hukumat of Hamadoni arrives at the Jamoat Office.	Jamoat Office	1. The Jamoat Chief receives the evacuation order from the Hukumat of Hamadoni. 2. The Jamoat Chief orders a messenger to go to the Head of Mahala.
7	8:27	The messenger of the Jamoat Office moves to the Head of Mahala on foot.	Messenger of Jamoat Office	The messenger of the Jamoat Office starts to the Head of Mahala on foot.
8	8:33	The messenger of the Jamoat Office arrives at the Head of Mahala.	Head of Mahala	The Head of Mahala receives the evacuation order.
9	8:35	The Head of Mahala starts disseminating the evacuation order to local residents.	Head of Mahala	The Head of Mahala disseminates the evacuation order to local residents through verbal communications, car horn, hand sirens, whistles, etc..
10	8:40	The residents start moving to the meeting area in the Mahala	Residents	After informed the evacuation order from the Head of Mahala, the residents take their important documents (passport, birth certificate, etc.) and move to the meeting area in the Mahala.
11	8:50	The residents get together at the meeting area in the Mahala	Head of Mahala, Residents	The Head of Mahala counts the number of the residents in the meeting area to confirm that all local participants get together.
12	9:00	The evaluation meeting is started.	All	Evaluation and Discussion: 1. What is the problem for information dissemination? 2. How to improve? 3. Who has responsibility?
13	9:30	The evaluation meeting is finished.	All	

For a better tomorrow for all.

THE STUDY ON NATURAL DISASTER PREVENTION IN PYANJ RIVER IN THE REPUBLIC OF TAJIKISTAN

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Newsletter on The Study on Natural Disaster Prevention in Pyanj River



Vol.7, 21 September 2007

1. Summary of the Network Communication Drill

The CoES, the Hukumat of Hamadoni, JICA Study Team and other concerned organizations have conducted a Network Communication Drill on 29 August 2007, as a part of the Pilot Project on Local Communication Network for Disaster Management in Hamadoni District. The target network alignment is, the Patrol Team on Dike -> Hukumat of Hamadoni -> Jamoat Office in Turdiev (Kishlak Metintugay) -> Mahalla Sarhadchi. The situation was assumed that VHF radios, land line phones and mobile phones were not available except between the Patrol Team and Hukumat of Hamadoni. Totally 61 local residents of 8 households, several officials in charge of emergency situations, CoES Headquarters, CoES Zonal Headquarters in Kulyab and CoES Local Headquarters in Hamadoni participated in the Drill. The results of the Drill are as follows:

- At 8:00, a duty staff of Hukumat of Hamadoni received a CSR from the Patrol Team on the dike through VHF radio: "The dike is eroded seriously and facing to breach soon". Then, the duty staff made an information sheet for reporting.
- At 8:04, the duty staff reported to the Deputy Chairman of Hukumat of Hamadoni about the CSR. Then, an evacuation order document was prepared.
- At 8:08, Deputy Chairman signed the evacuation order.
- At 8:10, the messenger started for the Jamoat Office in Turdiev by car.
- At 8:30, the messenger arrived at the Jamoat Office in Turdiev and informed the evacuation order to a representative of the Jamoat Office.
- At 8:32, the messenger of the Jamoat Office started for the house of the Deputy Head of Mahalla Sarhadchi on foot.
- At 8:36, the Deputy Head of Sarhadchi received the evacuation order from the messenger at his house.
- At 8:38, the Deputy Head of Sarhadchi began to disseminate the evacuation order to residents using Hand Siren. Then the residents began to move.
- At 8:45, the residents arrived at the meeting area. Deputy Head of Sarhadchi began to count the number of residents.
- At 8:50, Deputy Head of Sarhadchi reported to the official of CoES Zonal Headquarters in Kulyab that 61 people got together.

The evaluation meetings with residents were held just after the Drill. The summary of their discussion is:

- (1) The residents in Sarhadchi are well-organized for evacuation activities. 61 people (mainly women and children) got together at the meeting area with ID documents within 7 minutes after the dissemination of evacuation order.



08:00, 29/08/2007
Patrol Team on Dike



08:08, 29/08/2007
Signature for the evacuation order



08:10, 29/08/2007
Car Messenger started for the Jamoat Office



08:30, 29/08/2007
Representative of Jamoat received the evacuation order



08:36, 29/08/2007
Deputy Head of Sarhadchi received the evacuation order



08:45, 29/08/2007
The residents gathered.

So, the timing, when the evacuation will start, is a next challenge. Evacuation should be completed before the flood water arrives at Sarhadchi.

- (2) The JICA Study Team explained that, in the Master Plan, an evacuation preparation warning is planned to disseminate to residents before the evacuation order, in order to make evacuations efficiently. The evacuation preparation warning will be disseminated among the residents through verbal communication, etc.
- (3) The residents in Sarhadchi became to recognize the sound of Hand Siren as an evacuation order. (Hand Sirens are used for only an immediate evacuation order.)
- (4) Some households have family members with hearing difficulties. The other family members will inform those vulnerable persons about an evacuation order.
- (5) Transportation in evacuation is also a major challenge.

The evaluation meeting with the representatives were held on 30 September 2007 at the Hukumat of Hamadoni. Participants were Hukumat of Hamadoni, Jamoat Offices (Turdiev, Dashti Gulo, Kalinin, Qahramon), Deputy Head of Sarhadchi, CoES Headquarters in Dushanbe, CoES Zonal Headquarters in Kulyab, CoES Local Headquarters in Hamadoni, Mission East, and Caritas. The summary of the discussion is as follows:

- (1) The drill before or after the flood season should be considered because a flood season is also a cotton season.
- (2) Security and Medical Service should be prepared for just in case.
- (3) The Patrol Teams involving CoES, MMWR, Hukumat of Hamadoni, Jamoat Office and residents should be established.
- (4) A hydrological post with radio communication for automatic measuring of water level on the border zone should be considered.

2. Progress of Communication Network System

The organizations which have at least one responsible person for communication network in emergency situations are Hukumat of Hamadoni, all 8 Jamoats, 54 of 56 Kishlaks and 210 Mahallas. (As of 16 September 2007)

3. Progress of Support System for Vulnerable People in Flood Evacuation

Totally 790 vulnerable people and 1349 supporters are registered in 5 Jamoats. (As of 16 September 2007)

4. Working Group Seminar in Dushanbe

On 19 September 2007, the seminar for the Working Group of the Study on Natural Disaster Prevention in Pyanj River was held at the CoES Headquarters in Dushanbe. The CoES, MMWR and other related organizations were invited. During the seminar, a preliminary result of the Network Pilot Project was reported to the delegates. Then future challenges and recommendations were discussed as follows:



- (1) Updating of the communication network and support system are essential.
- (2) Conductions of drills in other areas in Hamadoni and conductions before flood season should be considered.
- (3) The patrol team for dike / canal monitoring during flood season should be established.

For a better tomorrow for all.

THE STUDY ON NATURAL DISASTER PREVENTION IN PYANJ RIVER IN THE REPUBLIC OF
TAJIKISTAN

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**SECTOR 11 FLOOD MONITORING FOR
RIVER STRUCTURES**

SUPPORTING REPORT

**SECTOR 11 FLOOD MONITORING FOR RIVER
STRUCTURES**

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SECTOR 11. FLOOD MONITORING FOR RIVER STRUCTURES

11.1 OBJECTIVES OF THE MONITORING FOR RIVER STRUCTURE

The monitoring of river structures during the flood season was carried out in the 3rd field survey, aiming as follows:

To undertake the transfer of technology on the method of structural monitoring during floods;

To amend the monitoring manual to make it adaptable to the conditions in Pyanj River; and

To work with the counterpart members in evaluating the results of monitoring to be utilized for the river structural planning.

11.2 EXISTING ARRANGEMENT OF RIVER DIKES

In this section, the present condition of the main dike and the allocation of spur dikes are explained compared with the conditions in 2006 when the Interim Report was prepared.

11.2.1 Condition of Main Dike and Guide Dikes

Around the end of 2006 until the beginning of 2007, heightening of river dike, extension of river dike by 900 m and the restoration works in the downstream stretch from 9.0 km were executed in accordance with the results of field survey carried out by the JICA study team. Compared to the condition at the end of 2006, the present condition of the revetment of main dike is almost unchanged.

In addition, the intake guide dike was also heightened and, especially, the upstream edge of the intake guide dike was improved by widening, placing of concrete blocks, and installation of smooth concrete revetment.

As to the spillway guide dike, it was widened and extended for about 200 m, and concrete blocks were installed at some portions to act against strong water flow and prevent scouring and erosion.

11.2.2 Condition of Placement of Spur Dikes

From January to May 2006, a total of thirteen (13) round head type of spur dikes were installed additionally along the main dike and the spillway guide dike.

Among the new spur dikes, nine (9) and two (2) spur dikes at the main dike were constructed by MMWR and JICA Pilot Project respectively. Then, the other two (2) spur dikes at the spillway guide dike were constructed using CoES budget.

Numbers of spur dikes are as shown in the following table.

Table R 11.2.1 Past Flood Events in Hamadoni Rayon

Stretch	As of Oct. 2006	At Present (Sept. 2007)
Main Dike	18	29
Intake Main Dike	9	9
Spillway Guide Dike	12	14
Total	39	52

In addition, the allocation of spur dikes is as illustrated in following figure. The yellow and green dots are corresponding to round head spur dikes (made of soil embankment) and concrete block spur dikes respectively.

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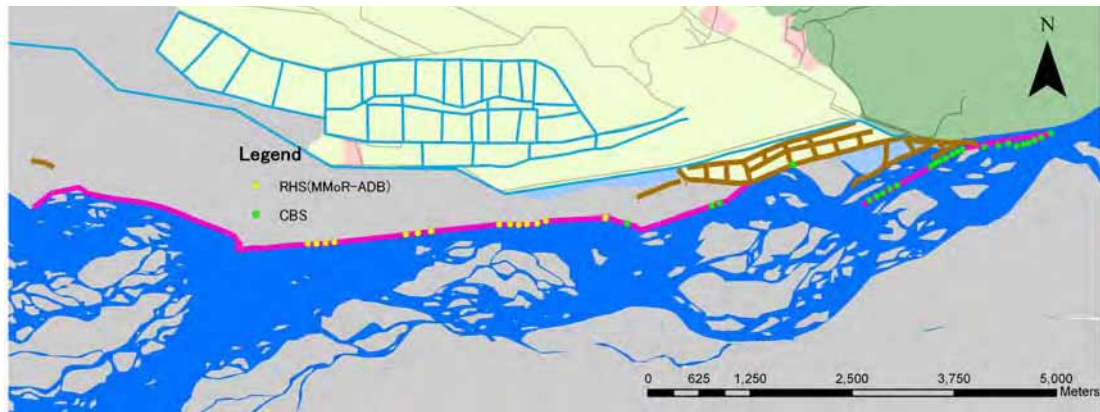


Fig. R 11.2.1 Allocation of Spur Dikes (As of October 2006)

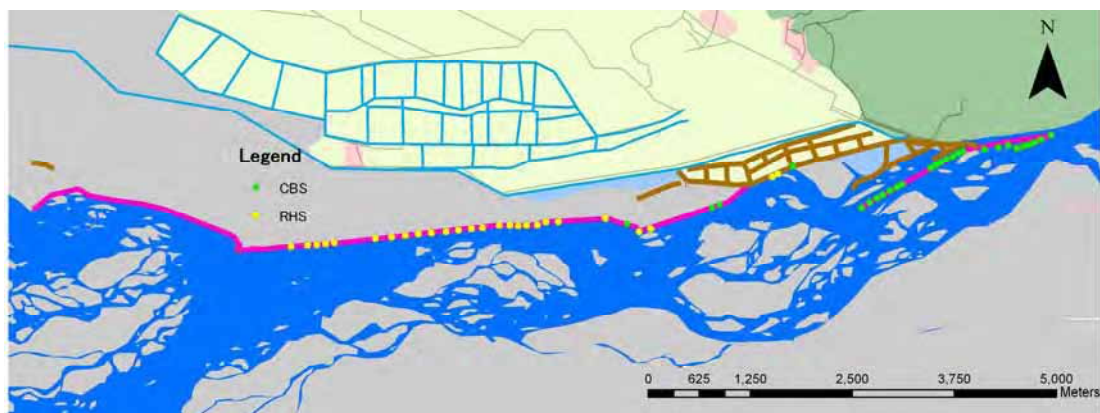


Fig. R 11.2.2 Allocation of Spur Dikes (Present Condition - Sept. 2007)

11.3 CHANGES IN FLOW CONDITION

11.3.1 Basic Information of River Dike

Based on the results of past field survey in this study, basic information on the present main dike are as summarized in Table 11.3.3. The items of information are as follows:

- River structure,
- River morphology
- Construction year of main dike
- Damage record
- Rehabilitation works
- Existing of revetment
- Allocation of spur dike

11.3.2 Situation of Holms and Superelevational Flow

1) Changes of Holms at Alluvial Fan

Utilizing the ASTER satellite maps taken during this study, the changing of holm condition in the last one (1) year at the Hamadoni alluvial fan are analyzed below. The shooting date of satellite maps in this study and the amount of flow discharge on the same date in Hamadoni are as shown in the following table.

Table R 11.3.1 Shooting Date of Satellite Maps and Flow Discharge

No.	Shooting Date	Flow Discharge at Hamadoni	Remarks
1	2006/07/31	2,502 (m ³ /s)	
2	2006/12/29	-	
3	2007/03/12	-	Cloud coverage area is large
4	2007/07/02	2,472 (m ³ /s)	2,200m ³ /s in Hirmanjo Observatory (W.L. 576m)

Among these satellite maps, No. 1 and No. 4 were used for this analysis, as shown in Fig. 11.1 at the back of this report. As compared to No. 1 and No. 2 satellite maps, the shape of holms in some places are different, as summarized in the following table, although the scale of both discharges at the shooting date in Hamadoni are almost equal in amount.

Table R 11.3.2 Changes of Condition of Holms

Section	Tajikistan Side	Afghanistan Side
0.0 – 4.0 km	No Change	
4.0 – 7.0 km	Disappearance of Large Holm	
7.0 – 14.0 km	Enlargement of Holms	Recession of Holms
Downstream from 14.0 km	No Change	No Change

The possible cause of the change of holm conditions between 7.0km and 14.0km is the constructed alignment of the new dike which diverts the flow direction to the Afghanistan side as a result of the bulging of the dike towards the Afghanistan side compared to the past alignment before the 2005 flood. In sum, the present amount of flow discharge to be diverted toward Afghanistan side is increasing compared with that in past condition of the main dike.

2) Present Water Colliding Fronts

In the middle of July 2007, a field survey was carried out to route out the water colliding fronts by the super elevation flow which head towards the river dike. The results of the survey are summarized in Table 11.3.3. These water colliding fronts caused by super elevation flow are generated by the cross-sectional slope established by holms and guide the flood flow towards the river dike.

11.3.3 Information from View Check of Project Site

In the middle of July 2007 in this study, the study team checked on the damage of dike of Pyanj River and the results of this check are as summarized in Table 11.3.3. As can be seen the table, still now the slope erosion and slide of revetment are happened at many portions in main and guide dike.

11.3.4 Election of Dangerous Section of Present Dike

The basic information mentioned in Subsections 11.3.1 and 11.3.3 is summarized in Table 11.3.3. Furthermore, the results of past visual check investigation for the river dike, which carried out in year 2006 and 2007, are as illustrated in following figure. These figure show that the place of seepage points and water collision fronts is changing.

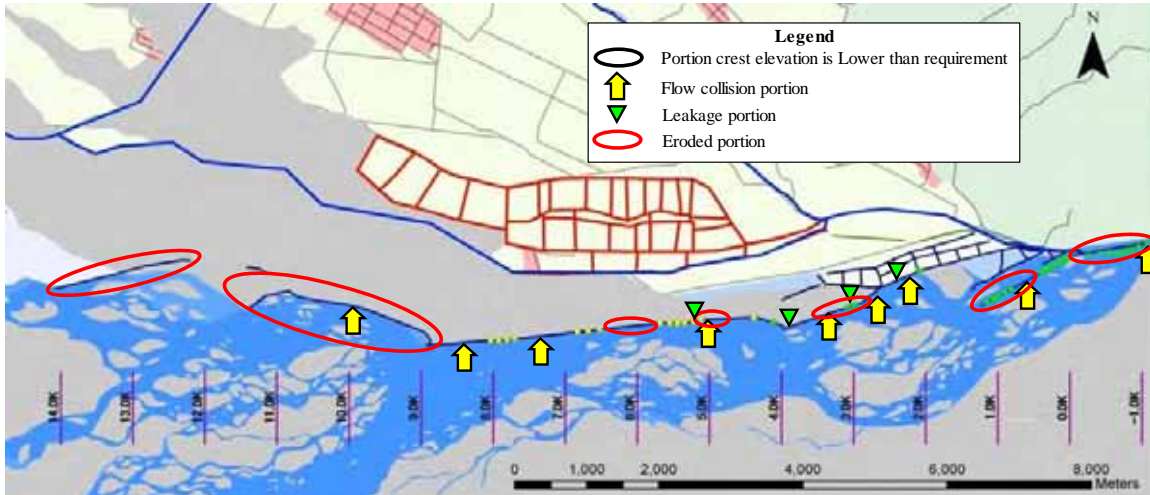


Fig. R 11.3.1 Information Map Based on Visual Check as of October 2006

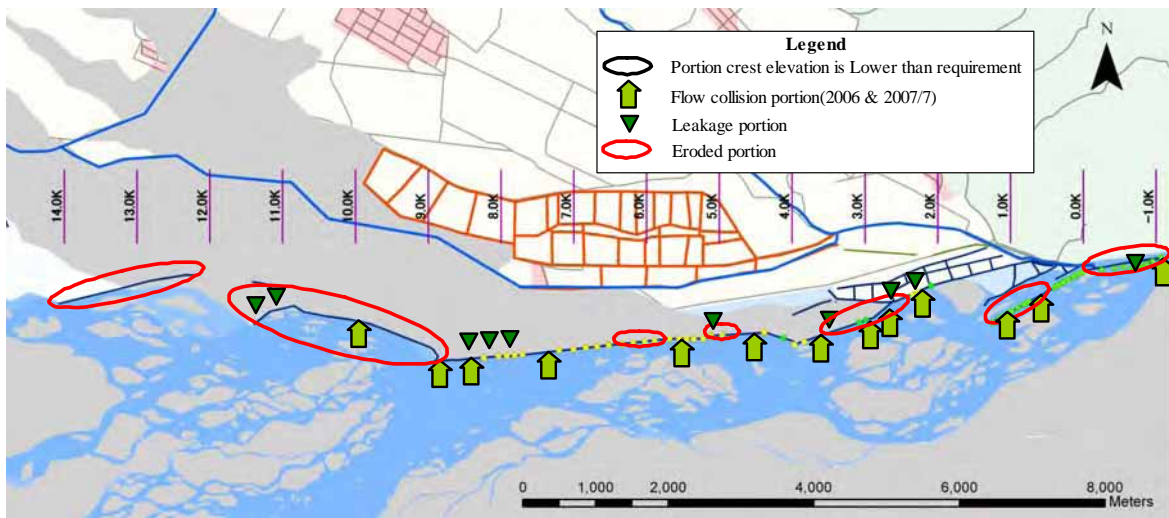


Fig. R 11.3.2 Information Map Based on Visual Check as of July 2007

The information and characteristics of river dike above mentioned are utilized to decide the monitoring point which are monitored as points of relevance.

11.4 MONITORING FOR RIVER STRUCTURES

11.4.1 Monitoring Item

Based on the “Technical Information Concerning Monitoring by Visual Check (issued by Japan Institute of Construction Engineering)”, monitoring items have been decided, as shown in the following table.

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Table R 11.4.1 Monitoring Items for Visual Check

Place	Recession Season	During Flood Season
River Side	<ul style="list-style-type: none"> - Deep Degradation of Riverbed - Situation of Vegetation - Condition of Sedimentation - Deformation of Spur Dike - Condition of Foot Protection for Spur Dike 	<ul style="list-style-type: none"> - Situation of Vegetation - Condition of Sedimentation
Slope of River Side Revetment	<ul style="list-style-type: none"> - Crack or Erosion of Bank Slope - Deformation of Erosion Resistance Works such as Concrete Revetment and Wire Mat - Deformation of Foot Protection - Lair of Small Animals - Condition of Washing Away of Soil Cover 	<ul style="list-style-type: none"> - Crack or Erosion of Bank Slope - Deformation of Erosion Resistance Works such as Concrete Revetment and Wire Mat - Lair of Small Animals
Crown of Dike	<ul style="list-style-type: none"> - Crack - Puddle - Erosion - Height of River Dike 	<ul style="list-style-type: none"> - Crack - Puddle - Erosion
Back Slope	<ul style="list-style-type: none"> - Crack or Erosion of Bank Slope - Condition of Furrow by Vehicle - Lair of Small Animals 	<ul style="list-style-type: none"> - Crack or Erosion of Bank Slope - Leakage or Seepage - Wet Condition - Condition of Furrow by Vehicle - Lair of Small Animals
Foot of Slope	<ul style="list-style-type: none"> - Deformation of Foot of Slope - Wet Condition - Lair of Small Animals - Existence of Depression Area 	<ul style="list-style-type: none"> - Deformation of Foot of Slope - Sand Boiling or Leakage/Seepage - Wet Condition - Lair of Small Animals
Inland Area	<ul style="list-style-type: none"> - Wet Condition of Ground Surface - Ground Uplift or Depression 	<ul style="list-style-type: none"> - Sand Boiling - Wet Condition of Ground Surface - Ground Uplift or Depression
Circumstance of River Structure (Chubek Weir)	<ul style="list-style-type: none"> - Deformation or Crack of Revetment - Difference in Level between Dike of Structure and River Dike - Aperture at Joint between Breast Wall and Wing Wall 	<ul style="list-style-type: none"> - Leakage or Sand Boiling from Joint between Breast Wall and Wing Wall - Leakage or Sand Boiling from Joint with Dike - Color of Water Flow in Waterway

11.4.2 Monitoring Target Area

According to the Technical Information, river dike monitoring should be executed at the sector upon the satisfaction of the condition indicated in following table. At the Pyanj River in the Hamadoni Alluvial Fan, the whole portion is adopted as the objective area for the structural monitoring. Thus, the structural monitoring was carried out at the main dike, the intake weir guide dike and the spillway guide dike.

Table R 11.4.2 Requirement for Monitoring Sector

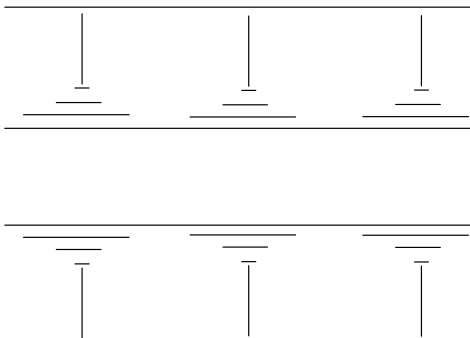
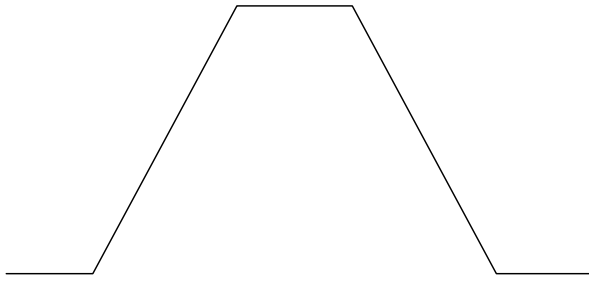
Item	Potential to Infiltration	Potential to Erosion
Result of Visual Check	<u>The section where there are worrisome deformations that seem to induce collapse of dike during flood time based on the result of visual check.</u>	
Damage Record	Existence of record	
Topographic Factor	<ul style="list-style-type: none"> - Circumstance of cross-dike structure - Former river 	<ul style="list-style-type: none"> - <u>Steep riverbed slope (1/60-1/400) without high waterbed</u> - <u>Tendency of degradation</u> - Circumstance of cross-dike structure and cross-river structure
Safety Factor	<ul style="list-style-type: none"> - No satisfaction with safety level as a result of detail investigation 	<ul style="list-style-type: none"> - <u>Over 2 m³/s of flow velocity</u> - <u>Sector likely to erosion collapse by flood</u>

Bold sentence are applied to the requirement of monitoring for. Pyanj River Dike

11.4.3 Preparation of Check Sheets

Based on the “Technical Information Concerning Monitoring by Visual Check (issued by Japan Institute of Construction Engineering)”, a check sheet was prepared to investigate and record the condition of the damaged area during the flood season. The check sheet is given in the following table.

Table R 11.4.3 Check Sheet for Structural Monitoring

Monitoring Form-1																																																																													
River System				River			Inspector			Date	Y	M	D																																																																
Side	Left/Right Bank		Site				Rayon			Jamoat																																																																			
Location		km Upstream / Downstream From																																																																											
<p>■ Inspection Point : Inland Area, Back Slope, Top of Dike, River Side Slope, River Side Area</p> <p>■ Condition Diagram</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Plain View</p> <p>[Inland Area]</p>  </div> <div style="text-align: center;"> <p>Cross-Sectional View</p> <p>[River Side] [Inland Area]</p>  </div> </div>																																																																													
<p>■ Contents of Deformed Condition</p> <p style="text-align: center;">Category</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Point</th> <th style="width: 60%;">Item</th> <th style="width: 25%;">No.</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Around Chubek Weir</td> <td>Leakage or Boil from Joint with Dike</td> <td></td> </tr> <tr> <td>Color of Water</td> <td></td> </tr> <tr> <td rowspan="2">River Side</td> <td>Condition of Vegetation</td> <td></td> </tr> <tr> <td>Condition of Sand Bar</td> <td></td> </tr> <tr> <td rowspan="5">River Side Slope</td> <td>Erosion</td> <td></td> </tr> <tr> <td>Crack</td> <td></td> </tr> <tr> <td>Slide of Concrete Block</td> <td></td> </tr> <tr> <td>Deformation of Gabion</td> <td></td> </tr> <tr> <td>Existence of Den</td> <td></td> </tr> <tr> <td rowspan="2">Top of Dike</td> <td>Crack</td> <td></td> </tr> <tr> <td>Erosion</td> <td></td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Point</th> <th style="width: 60%;">Item</th> <th style="width: 25%;">No.</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Back Slope</td> <td>Erosion</td> <td></td> </tr> <tr> <td>Crack</td> <td></td> </tr> <tr> <td>Leakage</td> <td></td> </tr> <tr> <td>Existence of Den</td> <td></td> </tr> <tr> <td rowspan="5">Foot of Back Slope</td> <td>Collapse</td> <td></td> </tr> <tr> <td>Leakage</td> <td></td> </tr> <tr> <td>Seepage or Sand boil</td> <td></td> </tr> <tr> <td>Wet Condition</td> <td></td> </tr> <tr> <td>Infiltration of Surface</td> <td></td> </tr> <tr> <td rowspan="4">Inland Area</td> <td>Infiltration</td> <td></td> </tr> <tr> <td>Bulge of Ground</td> <td></td> </tr> <tr> <td>Depression of Ground</td> <td></td> </tr> <tr> <td>Flow Condition of Filtration Water</td> <td></td> </tr> </tbody> </table>														Point	Item	No.	Around Chubek Weir	Leakage or Boil from Joint with Dike		Color of Water		River Side	Condition of Vegetation		Condition of Sand Bar		River Side Slope	Erosion		Crack		Slide of Concrete Block		Deformation of Gabion		Existence of Den		Top of Dike	Crack		Erosion		Point	Item	No.	Back Slope	Erosion		Crack		Leakage		Existence of Den		Foot of Back Slope	Collapse		Leakage		Seepage or Sand boil		Wet Condition		Infiltration of Surface		Inland Area	Infiltration		Bulge of Ground		Depression of Ground		Flow Condition of Filtration Water				
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11.4.4 Monitoring Point and Monitoring Period

1) Monitoring Point

Thirty (30) monitoring points as shown in the following figure were set along the main dike and the guide dikes in accordance the visual check information in Section 11.3 and the requirement for monitoring in Subsection 11.4.2. Since further flood damage has the potential to occur and bring about dike collapse at these points, the monitoring was carried out for the stretch of 100 m around the upstream and downstream of these points.

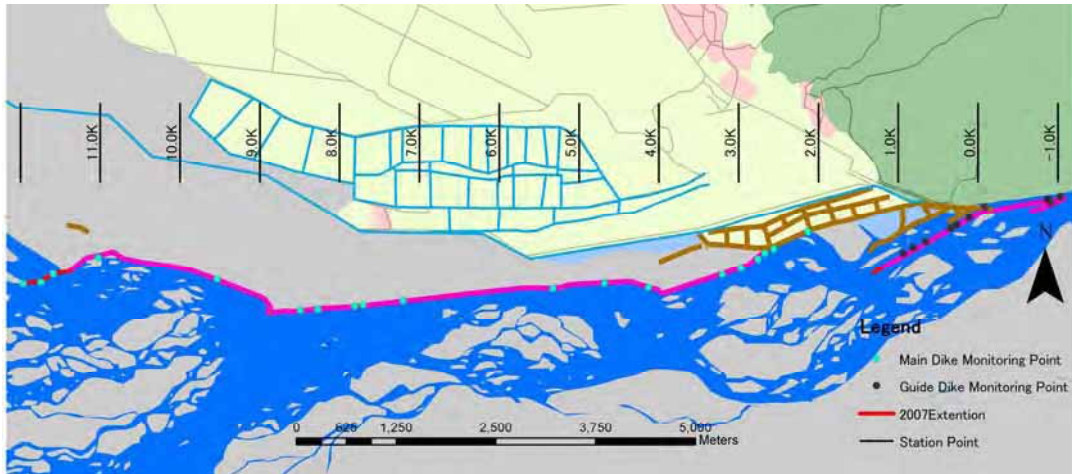


Fig. R 11.4.1 Monitoring Points

Based on the first visual check survey explained in Section 11.3, the present conditions of these monitoring points are as summarized in the table below.

Table R 11.4.4 Situation of Monitoring Point

Area	CP	KM	River Side Slope	Top of Dike	Back Slope	Foot of Back Slope	Inland Area
Main Dike	1	11.9	Erosion				
	2	11.7	Erosion				Wet
	3	11.5	Erosion				Infiltration
	4	11.0	Erosion	Erosion			
	5	9.5	Erosion	Erosion			
	6	8.6	Erosion				
	7	8.4	Erosion				Infiltration
	8	7.9					Infiltration
	9	7.8					Infiltration
	10	7.2					
	11	5.4					Infiltration
	12	4.8	Erosion, Slide of CB				Wet
	13	4.2	Erosion, Slide of CB				
	14	3.3	Erosion				Infiltration
	15	3.0	Erosion				
	16	2.9	Erosion				
	17	2.8	Erosion				Infiltration
	18	2.6					Infiltration
	19	2.2					Infiltration
Guide Dike	1	-1.0	Slide of CB				
	2	-0.97	Crack of Revetment				Infiltration
	3	-0.92	Erosion				
	4	-0.2	Erosion				
	5	0.2	Erosion Junction				
	6	0.3	Erosion				
	7	0.4	Slide of CB				
	8	0.5	Erosion, Slide of CB				
	9	0.7	Slide of CB				
	10	1.0	Erosion, Slide of CB				
	11	1.1	Erosion				

CB: Concrete Block

2) Monitoring Period and Frequency

The monitoring period was during the flood season in the third field survey after the Study Team arrived in Tajikistan, that is, the period between the beginning of July 2007 and the middle of September. The monitoring frequency is summarized in the table below.

Table R 11.4.5 Monitoring Period and Frequency

No.	Monitoring Portion	Frequency	Remarks
1	Monitoring Point	Everyday	30 monitoring points
2	Whole Alignment of River Dike	Once a week	

11.4.5 Monitoring Result

1) Main Dike and Guide Dikes

In the flood season mentioned above, the peak discharge was estimated at 2,700 m³/s, which was smaller than the annual average peak discharge (3,400m³/s) in Hamadoni. Nevertheless, the flood damage to the river dike occurred at three portions, as described in the table below.

Table R 11.4.6 Damage Record during July to Mid-September 2007 Monitoring Period

No.	Place	Damaged Portion	Contents of Damage	Damage Scale	Cause	Photo No.
1.	Main Dike	2.3 km	Revetment Concrete Block slid down and Cavity occurred under concrete blocks	About 20cm slide down; depth of cavity is about 50cm	Scouring	Fig. R 11.4.2
2.		2.3 km to 2.7 km	River side slope and top of Dike was eroded and revetment was washed out.	Maximum erosion width is about 4.0 m; Length is about 250 m.	Direct hit of water flow	Fig. R 11.4.3 to 11.4.5
	Intake Guide Dike	-	-	-	-	-
3.	Spillway Guide Dike	11.0 km	River side slope of Dike was eroded (between concrete block spur dikes).	Average erosion width is about 1 m; Length is about 40 m.	Scouring/ Wave by strong wind	Fig. R 11.4.7

The damage occurred especially in the water colliding front without firm revetment, as follows:

- (1) On 15 August 2007, one concrete block of the revetment at the 2.3km portion of the main dike in the pilot project area was dragged down by another concrete block at the adjacent project area via the wire which ties up both of them. The block slid down for about 20 cm. After then, as a result of view check on 7 September, there is the cavity with the depth of 50cm under the concrete blocks. The possible cause of the appearance of cavity is the erosion and scouring from the discontinuous surface generated at junction between pilot project area and adjacent project dike.



Fig. R 11.4.2 Damage of Main Dike 1

- (2) From 21 July 2007 to the end of August 2007, the riverside slope between the 2.3km and 2.7km portion of the main dike got eroded. The length and maximum width of the eroded portion was about 250 m and 4 m respectively. The flood flow of Pyanj River hit

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this portion directly, and the flood flow along the main dike had a rapid flow velocity compared with those in other places so that the revetment by the armour concrete blocks were completely washed away as shown Fig.11.4.3 to 11.4.5. PMK 39 was engaged to repair the damaged portion with sand, gravel and concrete blocks. Incidentally, this water collision moved to the spur dike of pilot project in the end of August due to the recession of the upstream sedimentation of pilot project site as shown in Fig.11.4.6.



Fig. R 11.4.3 Damage of Main Dike 2 (25 July)



Fig. R 11.4.4 Damage of Main Dike 2 (1 September)



Fig. R 11.4.5 Damage of Main Dike 2 (From Downstream, 1 August)

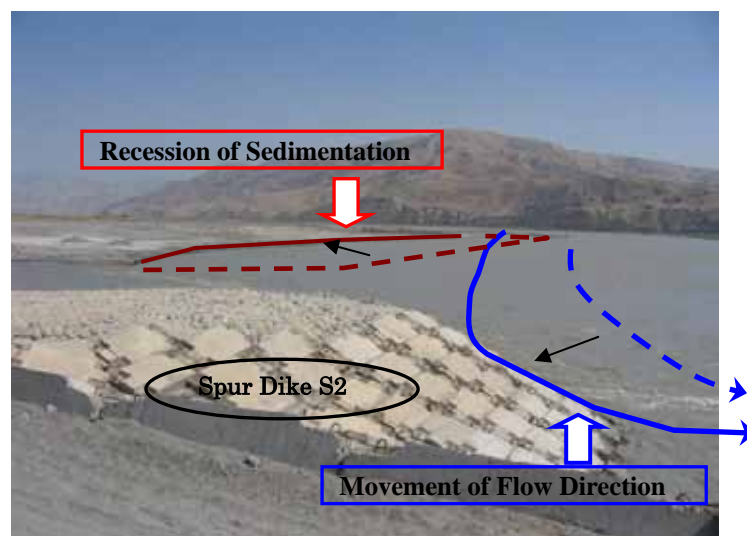


Fig. R 11.4.6 Movement of Water Collision Front

- (3) On 25 July 2007, the riverside slope at around the 1.0km portion of the spillway guide dike got eroded for a length of 15 m and the average width of 1 m. Although this portion is situated between spur dikes, it has no revetment. Hence, it was damaged by river surface waves generated by strong wind and disturbed flow by Superelevation flow. Fortunately, the super elevation flow that headed towards the guide dike changed its direction and became parallel to the guide dike at 10 m away from the river dike. The restoration works for this damaged portion was carried out by private company employed by CoES.



Fig. R 11.4.7 Damage of Spillway Guide Dike (around 1.0km)

2) Pilot Project Site

At the pilot project site, the monitoring was carried out especially considering the following indications:

- Intergradations of revetment of surface slope of spur dike
- Intergradations of revetment of surface slope of main dike
- Intergradations of height of spur dikes
- Crack of revetment and surface of mortar stone masonry
- Leakage and seepage

Overall, the site of the Pilot Project did not suffer from flood during the monitoring period except for the following incidents:

- Slide-down of concrete blocks at the downstream edge of the Pilot Project due to collapse of the adjacent project area (refer to Item 1);
- Small crack with the width of less than 5 mm at the surface of the mortar stone masonry; and
- At the junction of downstream side between spur dike S2 and main dike, the collapse of concrete was happened and as a result of that the soils under the concrete blocks was washed away with the depth of 20cm. This collapse was found out after decreasing the water level of Pyanj River in the beginning of September 2007.

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3) All Soil Spur Dikes

Investigations on the damaged condition of spur dikes were carried out in December 2006 and July 2007. Table 11.4.7 presents the damage condition of all spur dikes at the main river dike and the guide dike.

Table R 11.4.7 Condition of Spur Dikes

Section	No.	Type of Spur Dikes	No.	Completion Year	Condition of Damage		Factor of Damage
					December 2006	July 2007	
Main Dike	1	CBS	C1	N/A	Misalignment among concrete blocks	same as on the left	
	2	CBS	C2	N/A	Partial collapse	same as on the left	
	3	CBS	C3	N/A	Partial collapse	same as on the left	
	4	CBS	C4	N/A	Washed out 9m of total length (original length=3	same as on the left	
	5	RHS	R1	2007 (JICA PP)	-	Nothing	
	6	RHS	R2	2007(JICA PP)	-	Nothing	
	7	RHS	R3	2007	-	Collapse of concrete block at Toe	
	8	RHS	R4	2007	-	Toe and flank is damaged	
	9	RHS	R5	2006	Nothing	same as on the left	
	10	RHS	R6	2007	-	Collapse of concrete block at Toe	
	11	RHS	R7	2006	Toe is damaged	same as on the left	
	12	RHS	R8	2006	Toe and flank is damaged	Collapse of concrete block at Toe	Superelevational Flow
	13	RHS	R9	2006	Toe is damaged	same as on the left	
	14	RHS	R10	2006	Toe is damaged	Toe and flank is damaged	Superelevational Flow and Salient Position
	15	RHS	R11	2006	Toe is damaged	same as on the left	
	16	RHS	R12	2006	Toe is damaged	same as on the left	
	17	RHS	R13	2007		Toe and flank is damaged	
	18	RHS	R14	2007		Toe and flank is damaged	
	19	RHS	R15	2007		Toe and flank is damaged	
	20	RHS	R16	2007		Toe and flank is damaged	
	21	RHS	R17	2006	Toe and flank is damaged	Toe and flank is damaged	
	22	RHS	R18	2006	Nothing	Toe is damaged	Unclear
	23	RHS	R19	2006	Nothing	Toe and flank is damaged	Unclear
	24	RHS	R20	2007		Toe is damaged	
	25	RHS	R21	2007		Toe and flank is damaged	
	26	RHS	R22	2006	Toe and flank is damaged	Toe and flank is damaged	Unclear
	27	RHS	R23	2006	Nothing	same as on the left	
	28	RHS	R24	2006	Nothing	same as on the left	
	29	RHS	R25	2006	Toe is damaged	same as on the left	
	30	RHS	R26	2007	-	Toe and flank is damaged	
Intake Guide Dike	1	Revetment Blocks	C1	2006	Misalignment at Toe	same as on the left	
	2	CBS	C2	2006	Nothing	same as on the left	
	3	CBS	C3	2006	- Ditto -	same as on the left	
	4	CBS	C4	2006	- Ditto -	same as on the left	
	5	CBS	C5	2006	- Ditto -	same as on the left	
	6	CBS	C6	2006	- Ditto -	same as on the left	
	7	CBS	C7	2006	- Ditto -	same as on the left	
	8	CBS	C8	2006	Collapse of concrete block at Toe	same as on the left	
	9	CBS	C9	2006	Nothing	same as on the left	
Spillway Guide Dike	1	CBS	C10	2006	Nothing	same as on the left	
	2	CBS	C11	2006	- Ditto -	same as on the left	
	3	CBS	C12	2006	- Ditto -	same as on the left	
	4	CBS	C13	2006	- Ditto -	same as on the left	
	5	CBS	C14	2006	- Ditto -	same as on the left	
	6	CBS	C15	2006	- Ditto -	same as on the left	
	7	CBS	C16	2006	- Ditto -	same as on the left	
	8	CBS	C17	2006	Collapse of concrete block at Toe	same as on the left	
	9	CBS	C18	2006	Collapse of concrete block at Toe	same as on the left	
	10	CBS	C19	2006	Collapse of concrete block at Toe	same as on the left	
	11	CBS	C20	2006	Nothing	same as on the left	
	12	CBS	C21	2006	- Ditto -	same as on the left	
	13	RHS	R28	2007	- Ditto -	same as on the left	
	14	RHS	R29	2007	- Ditto -	same as on the left	

Blue Sentence: Damaged spur dikes constructed at the beginning of 2007

Red Sentence: Extension of damage to Spur dikes constructed in 2006

11.5 WATER LEVEL OBSERVATION AND SIMULATION

For the establishment of river planning on the Master Plan, the high water level in case of 100 - year flood was calculated by the non-uniform flow calculation model. In this section, the reliability in the model was checked by using the results of observation during monitoring period.

11.5.1 Benchmark and Station Point

The study team drove small wooden piles on the crest of the main dike from Chubek intake weir to the end of the present dike. The interval of BMs was about 1km and based on the BM, the alignment of main dike was estimated to be 12.9 km. During the third field survey, the study team had observed the water level of Pyanj River at benchmark point.

The station points denote direct distances from the Chubek intake weir. According to the station point in Fig. 1.9.1 at the Sector I, Supporting Report for the Interim Report, the Chubek intake weir is positioned at the station point of 0.0 km [abbreviated as P(0.0)], and the end of the dike is located at P(11.4). Incidentally, the distance from Chubek intake weir to Sayyod hill is 19.0 km based on the station point.

11.5.2 Confirmation of Reliability of Non-Uniform Calculation Model

1) Condition for Confirmation

The confirmation of the model was carried out by using the data observed on 25 June because the maximum water level at Hamadoni was observed on the day. In addition, the discharge at Hamadoni was estimated from the discharge observed in Hirmanjo which was calculated by using water level and water - discharge relationship defined in hydraulic analysis in Interim Report. The boundary condition for the confirmation is summarized in following table.

Table R 11.5.1 Boundary Condition for Non-Uniform Calculation

No.	Boundaries	Contents
1	Objective River Reach	From P(0.0) to P(9.0) (From BM 0.0 km to BM 10.0 km)
2	Water Depth of Starting point	The water level of 502.21 meters at starting point P (9.0) is set from the observation data on 28 July at Hamadoni.
3	Discharge Distribution	The calculation is carried out on 2,687 m ³ /s discharge case in Chubek Intake Weir. In this regard, the river discharge along the main dike comes under the influence of superelevational flow by holms. Thus, the discharge distribution is determined based on the river course discharge rate and total discharge in Chubek intake weir, as described in the Supporting Report Sector 2 of the Interim Report.
4	River Cross Section	Cross-Sections are constructed from DEM developed from satellite image of SPOT. The cross-sectional calculation area is decided considering the river course range which is defined by using two-dimensional flow model as explained in the Supporting Report Sector 2 of the Interim Report.
6	Manning's Roughness Coefficient	N = 0.035 (at equal value as used in the Master Plan)

2) Calculation Result

The result of calculation, the observed water level as well as other information are graphed in following figure, which shows that the calculation result almost correspond with the observed water level on 28 June. Thus, the Non-Uniform Calculation model, which was established for River Planning on Master Plan, has the credibility to be utilized for calculation of water level in Pyanj River.

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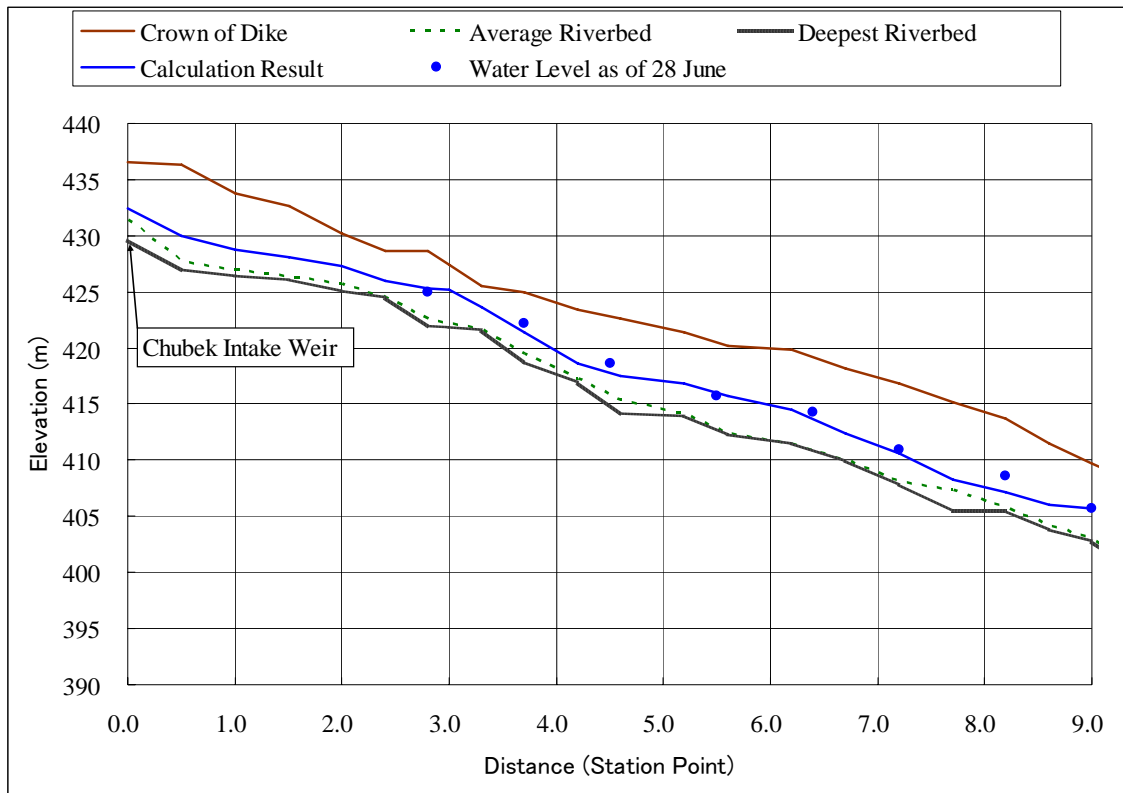


Fig. R 11.5.1 Result of Non Uniform Calculation)

11.6 EVALUATION AND RECOMMENDATION

11.6.1 Evaluation

1) Dikes

In this item, considering the monitoring results and the subsequent basic information, the risk ranking of dike condition is set. The items to judge the rank, the score corresponding to the items as well as the rule for marking the total point are as summarized in following table.

Table R 11.6.1 Hierarchical Ranking of River Dikes

No.	Condition	Point	Rank
1	No Existence of Spur Dike	1	$5 \leq S$: A $3 \leq S < 5$: B $1 \leq S < 3$: C $S = 0$: D S is sum total of points at any section in the dike.(A indicate most dangerous portion)
2	Inappropriate allocation of Spur Dike	1	
3	Non-existence of Revetment	2	
4	Bad Condition of Revetment	1	
5	Existence of Super-elevation Flow	1	
6	Existence of Past Damage (Except for 2005 flood damage)	1	
7	Existence of 2005 Flood Damage	1	
8	Unsatisfactory Dike Scale	2	

As a result of aggregating the point corresponding to items at any section of river dike, the risk ranking of the dike are as illustrated in Fig. R 11.6.1. The purple, orange yellow arrows indicate the rank A, B and C respectively (A indicates most dangerous).

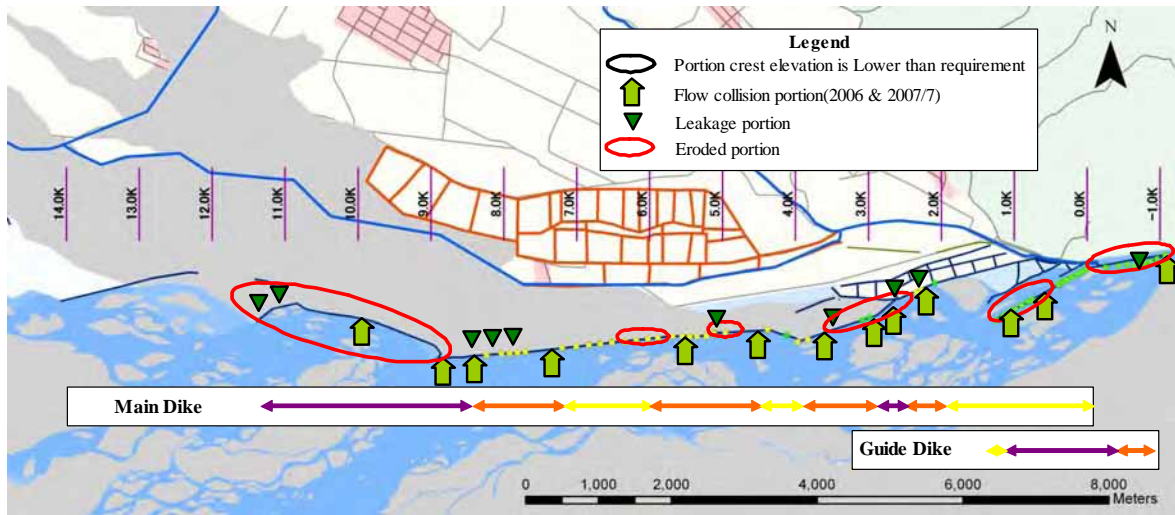


Fig. R 11.6.1 Risk Rank of River Dike

2) Spur Dikes

The situation of spur dikes during the investigations is as summarized below:

- The spur dike of Pyanj River is classified into two types by completion year; namely, Year 2006 and Year 2007. Among of them, the spur dikes completed in the beginning of 2007 were already damaged in May 2007 before the flood peak, although the floods of this year were not so large. Based on the results of interview survey, the length of the foot protection works was only 2 m and some of the foot protection works were completed as underwater works. It could then be presumed that the damage was caused by either the deficient length of foot protection works or the shoddy workmanship of the underwater works.
- According to Table 11.4.7, the damage to one third of the spur dikes was more in comparison with the damage in December 2006. The cause of damage to some spur dikes is attributed to the direct attack by super elevation flow and the juttred position of spur dikes. As to the cause of damage to other spur dikes, damage is not analogized; however, there are conceivable risks to damage by unsatisfactory foot protection works.

11.6.2 Recommendation

1) Execution of Systematic Monitoring for River Structures

To prevent the oversight of the dangerous portions during monitoring from the viewpoint of hydraulics and structural safety, systematic monitoring is necessary to assure the safety of river dike and to avoid easy dike breaching especially considering that the Pyanj River is rapidly changing in flow condition. Definitely, a monitoring manual and a check sheet is necessary, and the monitoring should be continued at fixed intervals using them because the river dike of Pyanj River is still vulnerable to flood flow until now based on the results of past monitoring. In addition, the monitoring point should be made a adjustment considering the condition of the river such as the movie of the water collision front depending on superelavational-flow.

The monitoring manual which was edited in Interim Report will amend in Draft Final Repot to be applied to the monitoring of river structure of Pyanj River, considering the monitoring result above mentioned. Then the check sheets for this monitoring can be utilized for the future monitoring in Pyanj River.

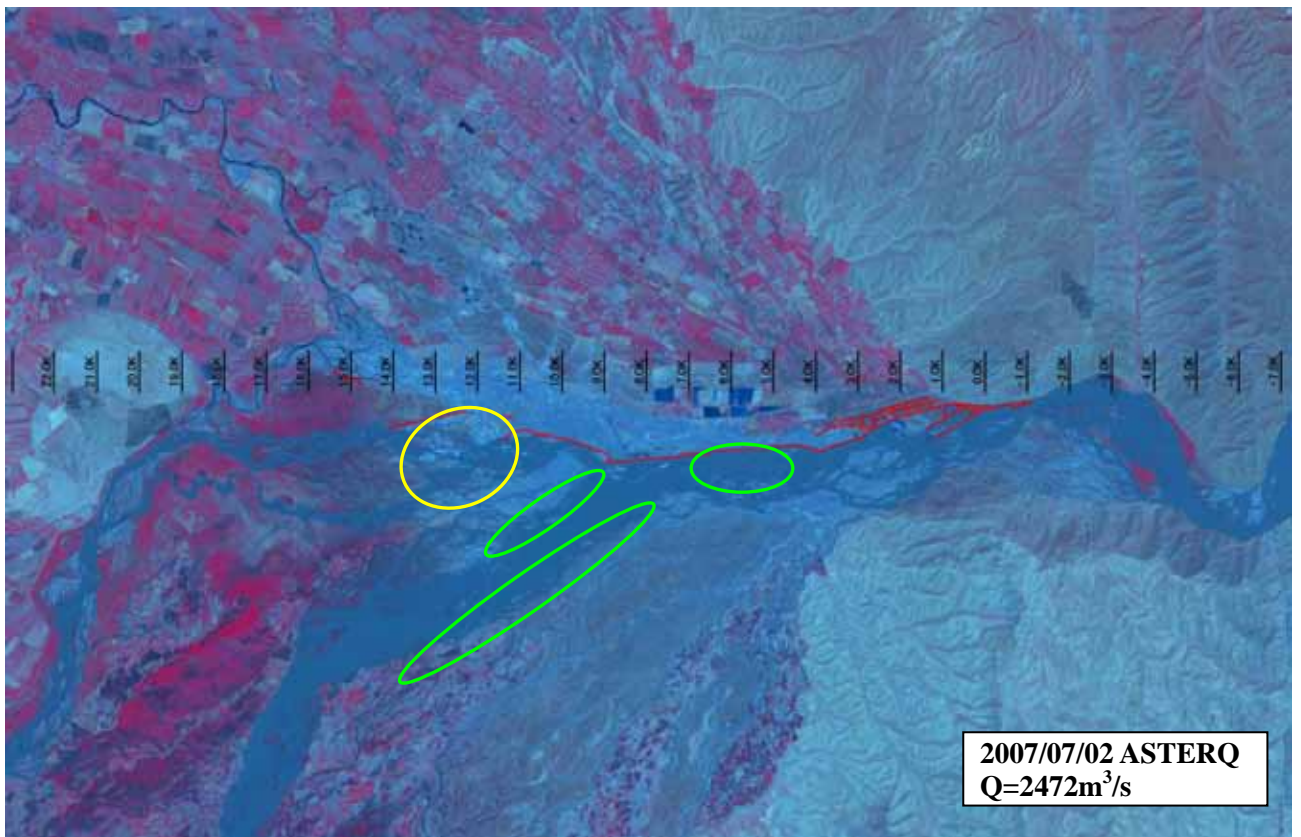
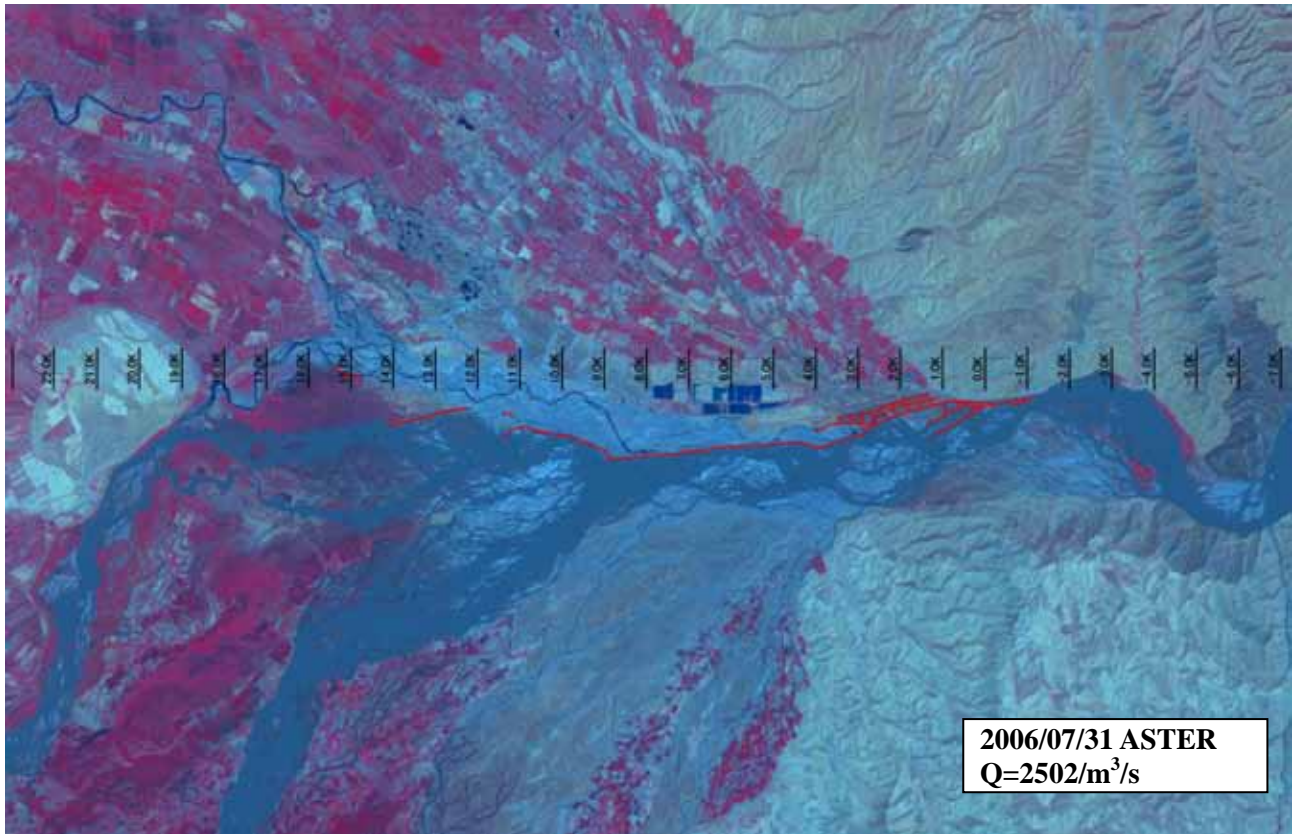
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2) To Make Database for Recording Damage History and Cause of Damage

There is inadequate information to probe the cause of flood damage in CoES. To prevent the repeated damage, it is recommended that relevant organizations should share information on flood damage; namely, accrual date, site of incidence, damage scale, conceivable cause of damage, implemented countermeasure, as well as comments about safety. Additionally, the database should keep information on river dikes to analyze the cause of damage; namely, 1) Implementation period to check when the implementation was carried out; 2) Scale of foot protection works; 3) Compaction degree of body; and 4) Implemented protection works.

ANNEXES

Table 11.1 Comparison of Satellite Maps



○ : Increase of Holms, ○ :Recession of Holms, — ; River Dike