

BRIEF DESCRIPTION OF IRRIGATION SUB-COMPONENTS OF INFRASTRUCTURE ACTIVITY

Pumping Stations

The table below shows 17 pumping stations to be included in the Project. While selecting the list out of the initially planned 68 pumping stations, the following factors were applied:

(i) regional approach to ensure inclusion of intensively irrigated areas where pumping is the only source for water supply, (ii) technical viability (e.g. hydrology, PS linked with main canals (MC) and drainage system (DR), pumping stations currently under operation, withdrawing water from Lake Sevan, etc.), (iii) Economic Rate of Return (ERR), (iv) environmental and social issues, (iv) cost per hectare, (v) energy consumed by pumping stations, (vi) saved energy, (vii) distance from Yerevan, and (viii) irrigated lands.

##	Pumping Station	Marz	Links with other components	Irrigated lands after the project [ha]	Distance from Yerevan [km]	ERR [%]
1	Mkhchian I stage	Ararat	MC, DR	2,958.0	20	15
2	Mkhchian II stage	Ararat	MC	14,081.0	20	
3	Ranchpar I stage	Armavir	MC, DR	2,682.5	20	
4	Ranchpar II stage	Armavir	MC	4,008.0	20	
5	Armash	Ararat	DR	1,481.0	60	50%
6	Khor-Virap	Ararat	DR	1,100.0	40	146%
7	Avshar-Aygevan	Ararat	DR	1,000.0	45	65%
8	Noyakert	Ararat	DR	618.0	45	60%
9	Baghramyan	Ararat	DR	261.0	30	18%
10	Burastan	Ararat	DR	101.0	25	14%
11	Noyemberyan I stage	Tavush		1,200.0	220	69%
12	Vorotan-2	Syunik		400.0	250	23%
13	Saralanj	Aragatsotn		700.0	80	28%
14	Dashtadem	Aragatsotn		348.0	75	14%
15	Martuni	Gegharkunik		440.0	120	26%
16	Zolakar	Gegharkunik		300.0	120	22%
17	Achajur I	Tavush		70.0	160	20%
	Total:			31,473.0		

Gravity Systems

The table below shows the list of 7 gravity systems selected out of 18. To prioritize among the contemplated gravity schemes the following factors have been taken into consideration: (i) technical viability; (ii) ERR; (iii) environmental and social issues; (iv) cost per hectare; (v) energy previously consumed by pumping stations; (vi) saved energy; (vii) distance from Yerevan; (viii) irrigated lands; (ix) elevation of lands (as higher is elevation as less is the demand for water); (x) willingness of farmers to pay for water or extended irrigated areas.

##	Gravity Systems	Irrigated lands after the project, [ha]	Saved Energy [MWh]	Distance from Yerevan [km]	ERR [%]
1	Spitak	800	2.05	100	85
2	Aigezard	702	0.29	60	29
3	Meghri	1,045	3.50	380	28
4	Halavar	200	0.13	75	46
5	Shenik	700	-	80	49
6	Vardenis	500	-	160	70
7	Mantash	800	-	80	79
	Total:	4,747.0	5.55		

Spitak Gravity System

The intention is to replace the existing Nalband canal by a pipeline (5.5 km). The existing pump station has not been operational since the 1990's. The main goals for this gravity system are:

- Reliable water supply (the existing canal is in a very difficult topographical location making it very difficult to operate the canal; accidents often happen).
- Existing lands are actually irrigated and the water management is good, so it is very likely that the irrigated area will be expanded.

Aygezard Gravity System

This gravity system envisages construction of a new 11 km branch canal to the Artashat main canal and will eliminate 2 pumping stations. The main goals for this gravity system are:

- Elimination of 2 pumping stations.
- Expansion of irrigated areas, which is expected because the gravity scheme is located in the Ararat Valley, where farming is very productive.

Meghri Gravity Scheme

This gravity scheme is intended to eliminate 8 main pumping stations (some with 2 stages and support pumps) with gravity water supplied from the Meghri River. The planned pipeline will be in total of 33 km long, with a 2 km long supply canal. The main goals for this gravity scheme are:

- Elimination of 8 pumping stations.
- Expansion of irrigated area, which is expected because this gravity scheme is located in dry sub-tropical Meghri area where farming is very productive.
- Existing closed tertiary system.
- Very active and well-managed irrigated area, with high valuable crops.
- Water reliability, because the pipeline will be shortened by 10 km.

Halavar Gravity Scheme

The intention is to change the Hartavan-Erinjatap pump station from electric power to a hydro-turbine deriving energy from releases from Aparan Reservoir. There are two delivery mains - Hartavan is on the right bank of the pump station and Erinjatap is on the left bank. The only items considered necessary are the new hydro-turbine and certain improvements on the existing pipe-lines and canals.

A consultant has been tasked to consider this in the final design of the gravity scheme.

This scheme is technically robust and viable because (i) the water source is sufficient, (ii) the lands are actually irrigated and the extension of irrigable lands is likely, and (iii) there is an existing tertiary system.

Shenik Gravity Scheme

This gravity scheme will rehabilitate the existing outlet canal (4.4km) from Hoktemberyan pumping station and connect the existing pipeline to B10 distributor to supply gravity water to the Shenik scheme and support the pumping station supply. The main goals for this gravity scheme are:

- Highly improved irrigation, especially at the tail end of the canal.
- Saving of pumping station irrigation water.
- If the rehabilitation of Talin main canal is undertaken, the system can fully switch to gravity supply.

Vardenis Gravity Scheme

Vardenis gravity scheme will rehabilitate 10 km of Masrik canal and eliminate 5 tubewells. The main goals for this gravity scheme are:

- Highly improved irrigation from DM 25+00 of Masrik canal.
- Elimination of 5 tube-wells.
- Elimination of the flooding of Akunk village.

Mantash Gravity Scheme

The original option of building a pipeline has been dropped. Instead, the intention is to rehabilitate the existing Gharanghu right-bank canal. The rehabilitation will repair emergency sections and all water management structures. The main goals for this gravity scheme are:

- highly improved irrigation, especially at the tail end of the canal.
- Saving of potable water, which is now used for irrigation, especially at the tail end.

Main canals

200 km of 6 main canals were planned to be rehabilitated in the scope of Infrastructure Activity. In the result of IA re-scoping and prioritization of sections and structures on 6 main canals it was decided to give the preference to the option which includes the following works:

- rehabilitation of structures e.g. outlets, gates, siphons etc., in emergency state;
- introduction of new water management structures; and
- rehabilitation of canal sections in emergency state, which means sections that could collapse at any moment and/or have high water losses.

##	Main Canal	Option 1	
		Length [km]	ERR [%]
1	Armavir	11.4	66%
2	Talin	13.0	25%
3	Artashat	2.7	49%
4	Low Hrazdan	2.8	40%

##	Main Canal	Option 1	
		Length [km]	ERR [%]
5	Arzni-Shmiram	8.0	25%
6	Shirak	-	23%
	Total:	37.9	

Drainage System

Based on the results of the Environmental/hydrological baseline study of wetlands in the Ararat Valley the following prioritized option has been chosen for the re-scoped IA in relation to the Ararat Valley drainage system rehabilitation:

##	Prioritized works
1	Cleaning and deepening of surface collectors
2	Removal of all backwater structures
3	River crossings for main drains
4	Transfer pump stations
5	Rehabilitation of artesian and tube wells
6	Rehabilitation of open and closed drains