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# **WWT management option for the Kidron Valley/Wadi Nar**

**(Jointly defined as underlying principle for Cost Benefit Analysis  
and Multi-Criteria-Decision Analysis)**

**Paper prepared for the  
German-Israeli-Palestinian research project:**

**“From conflict to collective action:  
Institutional change and management options to govern transboundary  
watercourses”**

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## List of abbreviations

WWT	Waste Water Treatment
PCBS	Palestinian Central Bureau of Statistics
Gihon	Israeli municipal owned utility responsible for water supply to Jerusalem
CM	Cubic Meter
MCM	Million Cubic Meter

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# **1 Introduction**

## **1.1 *Draft background***

Given the importance of Mountain Aquifer beneath the Kidron Valley/Wadi Nar as the most important water resource to be shared by the Palestinians and Israelis and the lack of sufficient water for drinking, agriculture, or industry, more and more attention has shifted to appropriate treatment and reuse of wastewater as a viable strategy for sustaining the region's limited water resources. But wastewater management, while already a huge issue in Israel and Palestine, remains in dire need of coordination of investments and collective and cooperative actions of both parties. This is especially true for the manifold transboundary basins in the region. The Kidron Valley/Wadi Nar is one of those transboundary basins, but the only basin where the Palestinians are the downstream riparian.

The Kidron Valley/Wadi Nar extends from the centre of Jerusalem to the Dead Sea. It collects untreated sewage from households of the East-Jerusalem (The old town of Jerusalem, Sheikh Jarrah, Wadi Al Jouz, Silwan, Al Thouri and Al Tour), some parts of West Jerusalem which drain due to gravity to the basin and the Palestinian localities Abu Dis, El Azzariya, Bethlehem, Beit Jala, Beit Sahur, Al Ubeidiya, other smaller Palestinian localities, and Sawahreh Sharqeyeh refugee camp which is then discharged into the Dead Sea. Not all of the localities have a central waste water collection system but the waste water collected in cesspits is later discharged into the nearby Wadi.

During the last decade many attempts have been done to solve the waste water problem of the Kidron Valley/Wadi Nar. (See e.g. GTZ, 1994, GTZ, 1998, Feitelson and Abdul-Jaber, 1997).

## **1.2 *Objective***

This discussion paper aims at showing the different management options identified and discussed by various stakeholders of both countries in order to harness wastewater which is recently flowing untreated in the Kidron Valley/Wadi Nar, for their livelihoods and environment. It also lists basin relevant recent and estimated future waste water production, which puts it in a strategic position to help in both parties in planning and small and large scale interventions.

Therewith it also forms the background for the Multi-Criteria Analysis and Cost Benefit Analysis with special emphasis on aligned research data use of all project partners taking account of the specific political constraints caused by the Israeli-Palestinian conflict.

The main objectives are as follows:

- Draft estimation of current status of sanitation of localities which drain into the basin with special emphasis of socio economic develop to estimate planning data
- Evaluation of the current and estimated future waste water production
- Description and mapping of available alternative waste water management options
- Alignment of planning data for other research components.

### **1.3 Methodology**

To achieve the main objectives, the following research methodology was adopted:

- Conduction of a detailed literature review, collect and analyze all available studies, technical reports and published data on former plans for wastewater treatment for the Kidron Valley/Wadi Nar;
- Identification of recent and potential waste water production inclusive a comprehensive stakeholder discussion of planning assumptions;
- Conduction of interviews with relevant Israeli and Palestinian stakeholders to identify ongoing planning for waste water treatment;
- Mapping of possible waste water treatment management options taking into account political constraints of the Israeli Palestinian conflict..

## **2 The Kidron Valley/Wadi Nar and its recent and estimated wastewater load**

### **2.1 *Actual waste water production and collection***<sup>1</sup>

Waste water from East-Jerusalem is only partly centrally collected in a system. A high amount of waste water (approx. 40% of total) originating from Palestinian households is still collected in cesspits and septic tanks.(e.g. Isaac and Hosh, 1997) The central collection system, which collects 80% of the total waste water, is declared to be generally over aged causing high technical waste water losses within the system. The collected sewage is, together with the rainwater run-off, drained via a pipe system into the Kidron Valley/Wadi Nar outside of Jerusalem city area. Due to hydrological conditions some smaller parts of West-Jerusalem are also drained into the Kidron Valley/Wadi Nar. Wastewater from central, western and north-western Jerusalem is drained to the En Soreq treatment plant. The sewage from north-east Jerusalem is drained into the Wadi Og (Muqalek) together with the sewage from other localities of the basin where some pre-treatment facilities are in use and the waste water is partially used for irrigation in the Jericho area by Israeli cooperatives.

Centrally collected wastewater from Beit Jala and the western parts of Bethlehem are disposed to the West-Jerusalem En Soreq treatment plant. The centrally collected wastewater from Beit Sahour and from the eastern parts of Bethlehem is pumped via a pipeline into Wadi Nar, together with effluents from East-Jerusalem, on to the Dead Sea.

Al-Ubeidiyeh, Al 'Eizariya and Abu Dis localities have no collection system. The waste water removed from the cesspits and septic tanks is disposed into the nearby Wadis. The locality Al-Ubeidiyeh suffers from sewage outflow of Bethlehem and East Jerusalem into the nearby Wadi Nar, creating problems of odor and mosquitoes.

### **2.2 *Actual and estimated waste water production***

Table 1 shows the actual and estimated waste water production of respective communities which actually drain or might drain into the Kidron Valley/Wadi Nar.

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<sup>1</sup> For a detailed analysis of water supply and waste water treatment in the West Bank and respective communities relevant for the KidronValley/Wadi Nar see Mutlak, N., Khateeb, N. and Klawitter, S. (2007) *Macro-economic setting and water supply, consumption and waste water disposal practise in the Kidron Valley/Wadi Nar*, Discussion paper, CollectiveWater project, Berlin, Jerusalem.



The population of the study area localities in Jerusalem and Bethlehem governorate and respective waste water production has been calculated based on information of Palestinian Central Bureau of Statistics (PCBS) (PCBS, 2003a, PCBS, 2003b). The figures given for East Jerusalem are drawn from Gihon planning data based on the 2003 Master Plan. (See Table 2)

Palestinian water consumption and waste water production data as well as planning data are partially drawn from official assumptions given in PWA, 2005 and KfW, 2006. They have been discussed with several stakeholders and agreed upon at the Palestinian stakeholder meetings. Israeli consumption and waste water production data are based on Gihon planning data. (See Table 1)

**Table 1: Planning assumptions**

	<b>Planning assumptions</b>	<b>Comment</b>
Annual population growth	3%	
Waste water production	80% of water consumption	
Water consumption households-Palestinian	140 Liter/capita/day (2020), Palestinian	Based on PWA planning data
Water consumption households - Israeli	200 Liter/capita/day Israeli	Based on actual water consumption
Water consumptions industrie	20% of household consumption (2010)	

Source: PWA, 2005, KfW, 2006, Gihon planning data, as informed about by Ilan Helbetz, Lavi Nativ engineers ltd, water, sewage & drainage planning engineers

Table 2: Population of the study area

Population	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Annual population growth	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Jerusalem Governorate															
Al 'Eizariya	16,884	17,391	17,912	18,450	19,003	19,573	20,160	20,765	21,388	22,030	22,691	23,371	24,073	24,795	25,539
Abu Dis	11,753	12,106	12,469	12,843	13,228	13,625	14,034	14,455	14,888	15,335	15,795	16,269	16,757	17,260	17,777
East Jerusalem	160,000	164,800	169,744	174,836	180,081	185,484	191,048	196,780	202,683	208,764	215,027	221,477	228,122	234,965	242,014
Israeli	100,000	103,000	106,090	109,273	112,551	115,927	119,405	122,987	126,677	130,477	134,392	138,423	142,576	146,853	151,259
Palestinian	60,000	61,800	63,654	65,564	67,531	69,556	71,643	73,792	76,006	78,286	80,635	83,054	85,546	88,112	90,755
Bethlehem Governorate															
Beit Jala*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bethlehem (East)*	8,738	9,000	9,270	9,548	9,835	10,130	10,434	10,747	11,069	11,401	11,743	12,095	12,458	12,832	13,217
Al Ubeidiya	8,300	8,549	8,805	9,070	9,342	9,622	9,911	10,208	10,514	10,830	11,155	11,489	11,834	12,189	12,554
Beit Sahour	14,921	15,369	15,830	16,305	16,794	17,298	17,816	18,351	18,901	19,469	20,053	20,654	21,274	21,912	22,569
Sawahreh	5,038	5,189	5,345	5,505	5,670	5,840	6,016	6,196	6,382	6,573	6,771	6,974	7,183	7,398	7,620
Sharqeyeh															
Others	5,340	5,500	5,665	5,835	6,010	6,191	6,376	6,568	6,765	6,967	7,177	7,392	7,614	7,842	8,077

Source: Authors compilation

## Cont. Population of the study area

Population	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual population growth	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
<b>Jerusalem Governorate</b>																
Al 'Eizariya	26,305	27,094	27,907	28,744	29,606	30,494	31,409	32,351	33,322	34,322	35,351	36,412	37,504	38,629	39,788	40,982
Abu Dis	18,311	18,860	19,426	20,009	20,609	21,227	21,864	22,520	23,196	23,891	24,608	25,346	26,107	26,890	27,697	28,528
East Jerusalem	249,275	256,753	264,456	272,389	280,561	288,978	297,647	306,577	315,774	325,247	335,004	345,055	355,406	366,068	377,050	388,362
Israeli	155,797	160,471	165,285	170,243	175,351	180,611	186,029	191,610	197,359	203,279	209,378	215,659	222,129	228,793	235,657	242,726
Palestinian	93,478	96,282	99,171	102,146	105,210	108,367	111,618	114,966	118,415	121,968	125,627	129,395	133,277	137,276	141,394	145,636
<b>Bethlehem Governorate</b>																
Beit Jala*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bethlehem (East)*	13,614	14,022	14,443	14,876	15,322	15,782	16,255	16,743	17,245	17,763	18,295	18,844	19,410	19,992	20,592	21,209
Al Ubeidiya	12,931	13,319	13,719	14,130	14,554	14,991	15,440	15,904	16,381	16,872	17,378	17,900	18,437	18,990	19,559	20,146
Beit Sahour	23,246	23,944	24,662	25,402	26,164	26,949	27,757	28,590	29,448	30,331	31,241	32,178	33,144	34,138	35,162	36,217
Sawahreh	7,849	8,085	8,327	8,577	8,834	9,099	9,372	9,653	9,943	10,241	10,548	10,865	11,191	11,527	11,872	12,229
Sharqeyeh	8,320	8,569	8,826	9,091	9,364	9,645	9,934	10,232	10,539	10,855	11,181	11,516	11,862	12,218	12,584	12,962
Others																

Source: Authors compilation

Table 3: Central waste water production and collection: households

Central waste water production and collection**	2006						2010						2015					
	Households	%	no.	l/cd	l/cd	m <sup>3</sup> /day	m <sup>3</sup> /a	%	no.	l/cd	l/cd	m <sup>3</sup> /day	m <sup>3</sup> /a	%	no.	l/cd	l/cd	m <sup>3</sup> /day
	Central connection	Capita connected	Water consumption	Waste water production*			Central connection	Capita connected	Water consumption	Waste water production*			Central connection	Capita connected	Water consumption	Waste water production		
Jerusalem Governorate				80%						80%						80%		
Al 'Eizariya	3%	522	141	112.8	59	21,480	3%	587	140	112	66	24,005	95%	21,556	140	112	2,414	881,215
Abu Dis	10%	1,211	147	117.6	142	51,962	10%	1,362	140	112	153	55,699	95%	15,005	140	112	1,681	613,417
East Jerusalem (J1)	80%	131,840	145	116	15,293	5,582,106	80%	148,387	170	136	20,181	7,365,935	95%	204,275	245	196	40,038	14,613,854
Israeli	95%	97,850	200	160	15,656	5,714,440	95%	110,131	200	160	17,621	6,431,653	95%	127,672	200	160	20,428	7,456,048
Palestinian	80%	49,440	90	72	3,560	1,299,283	80%	55,645	140	112	6,232	2,274,774	95%	76,603	90	72	5,515	2,013,133
Bethlehem Governorate																		
Beit Jala*	95%	0	49	39.2	0	0	95%	0	90	72	0	0	95%	0	90	72	0	0
Bethlehem (East)*	95%	8,550	62	49.6	424	154,792	95%	9,623	90	72	693	252,899	95%	11,156	90	72	803	293,179
Al Ubeidiya	0%	0	62	49.6	0	0	0%	0	90	72	0	0	95%	10,597	90	72	763	278,483
Beit Sahour	95%	14,600	62	49.6	724	264,322	95%	16,433	90	72	1,183	431,850	95%	19,050	90	72	1,372	500,633
Sawahreh Sharqeyeh																		
Others	0%	0	62	49.6	0	0	0%	0	90	72	0	0	95%	6,432	90	72	463	169,036
Total	5%	275	62	49.6	14	4,979	5%	310	90	72	22	8,134	95%	6,818	90	72	491	179,169
		172,448			35,872	7,511,258		194,091				9,479,013		294,889				12,384,313

Source: Authors compilation

Cont. Central waste water production and collection: households

Central waste water production and collection**												
Households	2020						2025					
	% Central connection	no. Capita connected	l/cd Water consumption	l/cd Waste water production	m <sup>3</sup> /day	m <sup>3</sup> /a	% Central connection	no. Capita connected	l/cd Water consumption	l/cd Waste water production	m <sup>3</sup> /day	m <sup>3</sup> /a
Jerusalem Governorate				80%					80%			
Al 'Eizariya	95%	24,989	140	112	2,799	1,021,570	95%	28,970	140	112	3,245	1,184,280
Abu Dis	95%	17,395	140	112	1,948	711,118	95%	20,166	140	112	2,259	824,381
East Jerusalem (J1)												
	95%	236,811	170	136	32,206	11,755,300	95%	274,529	170	136	37,336	13,627,615
	95%	148,007	200	160	23,681	8,643,603	95%	171,581	200	160	27,453	10,020,305
	90%	84,130	140	112	9,423	3,439,244	90%	97,530	140	112	10,923	3,987,027
Bethlehem Governorate												
Beit Jala*	95%	0	140	112	0	0	95%	0	140	112	0	0
Bethlehem (East)*	95%	12,933	140	112	1,448	528,695	95%	14,993	140	112	1,679	612,902
Al Ubeidiya	95%	12,285	140	112	1,376	502,193	95%	14,241	140	112	1,595	582,180
Beit Sahour	95%	22,084	140	112	2,473	902,798	95%	25,602	140	112	2,867	1,046,591
Sawahreh Sharqeyeh												
	95%	7,457	140	112	835	304,825	95%	8,644	140	112	968	353,376
Others	95%	7,904	140	112	885	323,098	95%	9,162	140	112	1,026	374,559
Total		337,184			44,869	16,377,145		390,888			52,015	18,985,600

Source: Authors compilation

Cont. Central waste water production and collection: households

Central waste water production and collection**	2030						2035						
	Households	%	no.	l/cd	l/cd	m <sup>3</sup> /day	m <sup>3</sup> /a	%	no.	l/cd	l/cd	m <sup>3</sup> /day	m <sup>3</sup> /a
	Central connection	Capita connected	Water consumption	Waste water production				Central connection	Capita connected	Water consumption	Waste water production		
Jerusalem Governorate				80%							80%		
Al 'Eizariya	95%	33,584	140	112	3,761	1,372,905	95%	38,933	140	112	4,360	1,591,573	
Abu Dis	95%	23,378	140	112	2,618	955,683	95%	27,101	140	112	3,035	1,107,898	
East Jerusalem (J1)	95%	318,254	170	136	43,283	15,798,141	95%	368,944	170	136	50,176	18,314,375	
Israeli	95%	198,909	200	160	31,825	11,616,280	95%	230,590	200	160	36,894	13,466,452	
Palestinian	90%	113,064	140	112	12,663	4,622,057	95%	138,354	140	112	15,496	5,655,910	
Bethlehem Governorate													
Beit Jala*	95%	0	140	112	0	0	95%	0	140	112	0	0	
Bethlehem (East)*	95%	17,381	140	112	1,947	710,521	95%	20,149	140	112	2,257	823,689	
Al Ubeidiya	95%	16,509	140	112	1,849	674,906	95%	19,139	140	112	2,144	782,401	
Beit Sahour	95%	29,679	140	112	3,324	1,213,286	95%	34,406	140	112	3,854	1,406,531	
Sawahreh Sharqeyeh	95%	10,021	140	112	1,122	409,660	95%	11,617	140	112	1,301	474,908	
Others	95%	10,622	140	112	1,190	434,217	95%	12,314	140	112	1,379	503,376	
Total		453,147			60,300	22,009,514		532,603			70,720	25,812,738	

Source: Authors compilation

Table 4: Central waste water production and collection: Industry and commerce

Central waste water production and collection Industry and commerce**	2006			2010			2015		
	%	Capita equivalent	m <sup>3</sup> /a	%	Capita equivalent	m <sup>3</sup> /a	%	Capita equivalent	m <sup>3</sup> /a
	% of central household production		Waste water production	% of central household production		Waste water production	% of central household production		Waste water production
<b>Jerusalem Governorate</b>									
Al 'Eizariya	10%	52	2,148	20%	117	4,801	20%	4,311	176,243
Abu Dis	10%	121	5,196	20%	272	11,140	20%	3,001	122,683
<b>East Jerusalem (J1)</b>									
Israeli	20%	19,570	1,142,888	20%	22,026	1,286,331	20%	25,534	1,491,210
Palestinian	10%	4,944	129,928	20%	11,129	454,955	20%	15,321	402,627
<b>Bethlehem Governorate</b>									
Beit Jala*	10%	0	0	20%	0	0	20%	0	0
Bethlehem (East)*	10%	855	15,479	20%	1,925	50,580	20%	2,231	58,636
Al Ubeidiya	10%	0	0	20%	0	0	20%	2,119	55,697
Beit Sahour	10%	1,460	26,432	20%	3,287	86,370	20%	3,810	100,127
Sawahreh Sharqeyeh									
Others	10%	0	0	20%	0	0	20%	1,286	33,807
Total	10%	28	498	20%	62	1,627	20%	1,364	35,834
			1,322,570			1,895,803			2,476,863

Source: Authors compilation

Cont. Central waste water production and collection: Industry and commerce

Central waste water production and collection Industry and commerce**	2020			2025			2030			2035		
	%		m³/a	%		m³/a	%		m³/a	%		m³/a
	% of central household production	Capita equivalent	Waste water production	% of central household production	Capita equivalent	Waste water production	% of central household production	Capita equivalent	Waste water production	% of central household production	Capita equivalent	Waste water production
<b>Jerusalem Governorate</b>												
Al 'Eizariya	20%	4,998	204,314	20%	5,794	236,856	20%	6,717	274,581	20%	7,787	318,315
Abu Dis	20%	3,479	142,224	20%	4,033	164,876	20%	4,676	191,137	20%	5,420	221,580
East Jerusalem (J1)												
Israeli	20%	29,601	1,728,721	20%	34,316	2,004,061	20%	39,782	2,323,256	20%	46,118	2,693,290
Palestinian	20%	16,826	687,849	20%	19,506	797,405	20%	22,613	924,411	20%	27,671	1,131,182
<b>Bethlehem Governorate</b>												
Beit Jala*	20%	0	0	20%	0	0	20%	0	0	20%	0	0
Bethlehem (East)*	20%	2,587	105,739	20%	2,999	122,580	20%	3,476	142,104	20%	4,030	164,738
Al Ubeidiya	20%	2,457	100,439	20%	2,848	116,436	20%	3,302	134,981	20%	3,828	156,480
Beit Sahour	20%	4,417	180,560	20%	5,120	209,318	20%	5,936	242,657	20%	6,881	281,306
Sawahreh Sharqeyeh												
Others	20%	1,491	60,965	20%	1,729	70,675	20%	2,004	81,932	20%	2,323	94,982
Total	20%	1,581	64,620	20%	1,832	74,912	20%	2,124	86,843	20%	2,463	100,675
			3,275,429			3,797,120			4,401,903			5,162,548

Source: Authors compilation



Table 5: Total wastewater production

Total	2006		2010		2015		2020	
	Capita equivalent	Waste water production m <sup>3</sup> /a	Capita equivalent	Waste water production m <sup>3</sup> /a	Capita equivalent	Waste water production m <sup>3</sup> /a	Capita equivalent	Waste water production m <sup>3</sup> /a
<b>Jerusalem Governorate</b>								
Al 'Eizariya	574	23,628	705	28,805	25,867	1,057,458	29,987	1,225,884
Abu Dis	1,332	57,158	1,635	66,839	18,006	736,100	20,874	853,341
<i>East Jerusalem (J1)</i>								
Israeli	117,420	6,857,328	132,157	7,717,983	153,206	8,947,258	177,608	10,372,324
Palestinian	54,384	1,429,212	66,774	2,729,729	91,924	2,415,760	100,956	4,127,093
<b>Bethlehem Governorate</b>								
Beit Jala	0	0	0	0	0	0	0	0
Bethlehem (East)*	9,405	170,271	11,548	303,479	13,387	351,815	15,519	634,434
Al Ubeidiya	0	0	0	0	12,716	334,180	14,741	602,632
Beit Sahour	16,060	290,754	19,719	518,220	22,860	600,759	26,501	1,083,358
Sawahreh Sharqeyeh	0	0	0	0	7,719	202,843	8,948	365,790
Others	303	5,477	371	9,761	8,181	215,003	9,484	387,717
<i>Total</i>	<i>199,477</i>	<i>8,833,827</i>	<i>232,910</i>	<i>11,374,816</i>	<i>353,867</i>	<i>14,861,176</i>	<i>404,620</i>	<i>19,652,574</i>
<hr/>								
Palestinian, incl. East-Jerusalem		1,976,499	100,752	3,656,833	200,661	5,913,918	227,012	9,280,250
Palestinian West Bank only		547,288		927,104		3,498,159		5,153,157

Source: Authors compilation

Cont. Total wastewater production

Total	2025		2030		2035	
	Capita equivalent	m <sup>3</sup> /a Waste water production	Capita equivalent	m <sup>3</sup> /a Waste water production	Capita equivalent	m <sup>3</sup> /a Waste water production
<b>Jerusalem Governorate</b>						
Al 'Eizariya	34,764	1,421,136	40,301	1,647,486	46,719	1,909,888
Abu Dis	24,199	989,257	28,053	1,146,820	32,521	1,329,478
<i>East Jerusalem (J1)</i>						
Israeli	205,897	12,024,366	238,691	13,939,536	276,708	16,159,743
Palestinian	117,036	4,784,432	135,677	5,546,468	166,025	6,787,092
<b>Bethlehem Governorate</b>						
Beit Jala	0	0	0	0	0	0
Bethlehem (East)*	17,991	735,482	20,857	852,626	24,179	988,427
Al Ubeidiya	17,089	698,616	19,811	809,887	22,967	938,881
Beit Sahour	30,722	1,255,909	35,615	1,455,943	41,288	1,687,837
Sawahreh Sharqeyeh	10,373	424,051	12,025	491,592	13,941	569,889
Others	10,995	449,471	12,746	521,060	14,776	604,051
<i>Total</i>	<i>469,066</i>	<i>22,782,720</i>	<i>543,776</i>	<i>26,411,416</i>	<i>639,123</i>	<i>30,975,286</i>
<a href="#">Palestinian, incl. East-Jerusalem</a>	<a href="#">263,169</a>	<a href="#">10,758,354</a>	<a href="#">305,085</a>	<a href="#">12,471,880</a>	<a href="#">362,415</a>	<a href="#">14,815,543</a>
<a href="#">Palestinian West Bank only</a>		<a href="#">5,973,922</a>		<a href="#">6,925,412</a>		<a href="#">8,028,451</a>

Source: Authors compilation

### **3 Wastewater treatment management options under discussion**

Recent experiences regarding the construction of joint infrastructure show clearly that both, Israeli and Palestinian officials vote for a separation of infrastructure, even if a joint infrastructure would be more feasible from a hydrological or economic perspective. (See e.g. FoEME, 2005, KfW, 2006 based on experiences with Wastewater treatment for Emek-Hefer - Tul-Karem) Even though also those options are taken into account, which include joint infrastructure for waste water treatment:

- Joint infrastructure and joint decision making, here referred to as joint
- Separated infrastructure but joint decision making, here referred to as separated
- Separated infrastructure, and unilateral action of one party, here referred to as unilateral

#### **3.1 Site for WWT treatment under discussion**

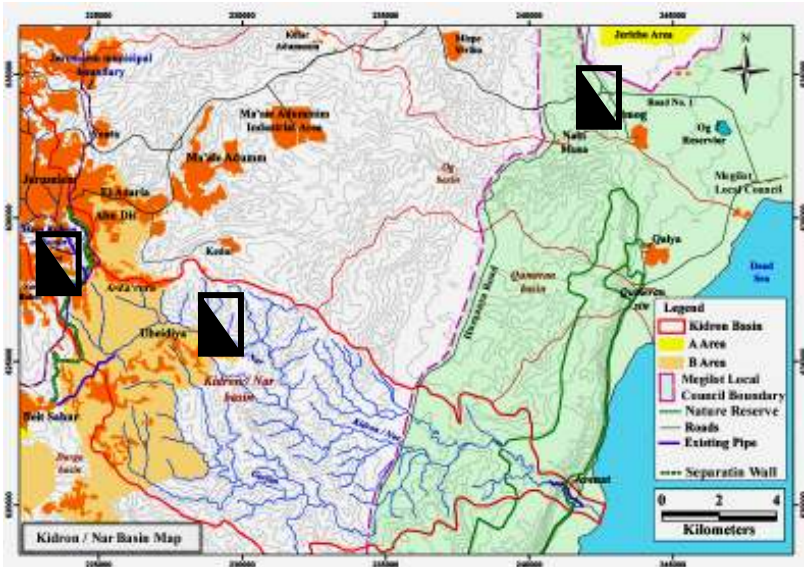
Thus, at present, due to political and hydrological restriction, the following sites for wastewater treatment are under discussion: (See Figure 1).

(a) The Wadi Nar site is situated in Area B next to the locality Al Ubeidiya within the basin close to the existing outflow of the wastewater originating in East-Bethlehem and other smaller Palestinian localities. Area B is under Palestinian civil administration, but still Israeli military administration.

(b) The Nebi Musa site is situated in Area C and under full Israeli administration. Due to the localization of the Nebi Musa site within the Wadi Og (Muqalek) the wastewater can not flow only by gravity and immense pumping over the water divide is necessary to collect the wastewater at the respective site. There are different routes for the collection pipe under discussion either collecting the sewage at its actual outflow and pump it up via a pipe routing East or West of Maale Adumim necessitating permission of Palestinian administration to cross Area A, or collecting the sewage further down the Wadi next to the Hurqanyia Road (C Area, next to Megilot Local Council boundary). At the Nebi Musa site sewage from North-Eastern Jerusalem, and Israeli settlements, as well as from the Wadi Quelt is already collected, pre-treated and partly re-used for irrigation.

(c) A third site is under discussion within the municipal boundary of annexed East-Jerusalem due to the fact that, from an Israeli perspective, no Palestinian administrative cooperation is needed even so this option would be very expensive due to high land use and construction costs caused by the fact that since 2006 the Jerusalem municipality has been under immense pressure to realize a wastewater treatment facility for East-Jerusalem according to Israeli law which also applies within annexed East-Jerusalem.

Figure 1: Sites of wastewater treatment plants under discussion



Source: Authors compilation<sup>2</sup>

### 3.2 Waste water treatment options under discussion

Drawing from intensive literature review and stakeholder interviews with Israeli and Palestinian representatives six (6) waste water treatment options have been identified. Table 6: Draft description of waste water treatment management options

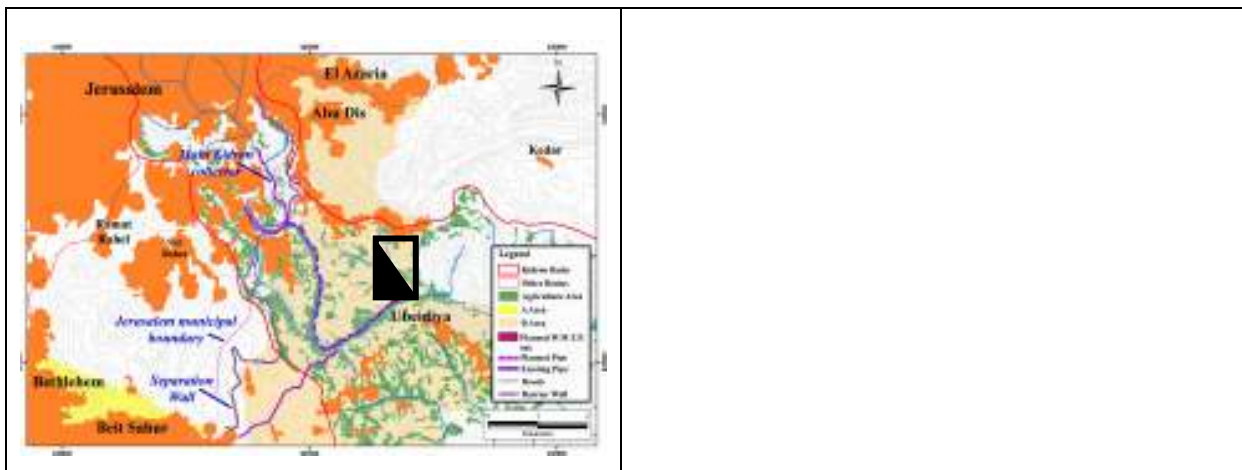
<sup>2</sup> all geographical map are based on Almog, R. (2006) Hebrew University Jerusalem.

<b>Waste water treatment option</b>	<b>Localities served</b>	
M1: Joint WWTP at Wadi Nar; operated under Palestinian authority	East-Jerusalem Al 'Eizariya Abu Dis Beit Jala Beit Sahour Bethlehem Al Ubeidiya Others	
M2: Joint WWTP at Nebi Musa, operated under Israeli authority, different transmission routes under discussion	East-Jerusalem Al 'Eizariya Abu Dis Beit Jala Beit Sahour Bethlehem Al Ubeidiya Others	
M3: 2 separate WWTP: Wadi Nar, operated under Palestinian authority and Nebi Musa, operated under Israeli authority	WWT Nebi Musa	WWT Wadi Nar
	East-Jerusalem	Al 'Eizariya Abu Dis Beit Jala Beit Sahour Bethlehem Al Ubeidiya Others
M4: 2 separate WWTP: Wadi Nar, operated under Palestinian authority and Jerusalem, operated under Israeli authority	WWT East-Jerusalem	WWT Wadi Nar
	East-Jerusalem	Al 'Eizariya Abu Dis Beit Jala Beit Sahour Bethlehem Al Ubeidiya Others
M5: Unilateral WWTP at Wadi Nar, operated under Palestinian authority	Al 'Eizariya Abu Dis Beit Jala Beit Sahour Bethlehem Al Ubeidiya Others	
M6: Unilateral WWTP at Nebi Musa, operated by IL (e.g. pumping via Hureqanyia road pipeline)	East-Jerusalem	

Source: Authors compilation

- Following the controversial disputed political status of annexed East-Jerusalem<sup>3</sup> the Palestinian team has adapted the above defined management options for their analysis in accordance to their political view: Many of the Palestinians consider East Jerusalem as part of the West Bank. This fact is taken into account in the following definition of management options which inform the discussion of management options as defined above:
- Option I analyses waste water treatment and reuse of wastewater from all Palestinian communities including East Jerusalem: Construction of a centralized treatment plant for the wastewater from all the Palestinian communities (including East Jerusalem) linked to Wadi Al-Nar. (This option informs M1, M2, and M5 )
- Option IIa analyses waste water treatment and reuse from all Palestinian communities excluding East Jerusalem: Construction of one separate treatment plant for the wastewater from all the Palestinian communities (excluding East Jerusalem) linked to Wadi Al-Nar. (This option informs M3 and M4)
- Option IIb analyses the treatment and reuse of wastewater from all Palestinian communities in East Jerusalem in a separate WWTP (additional)

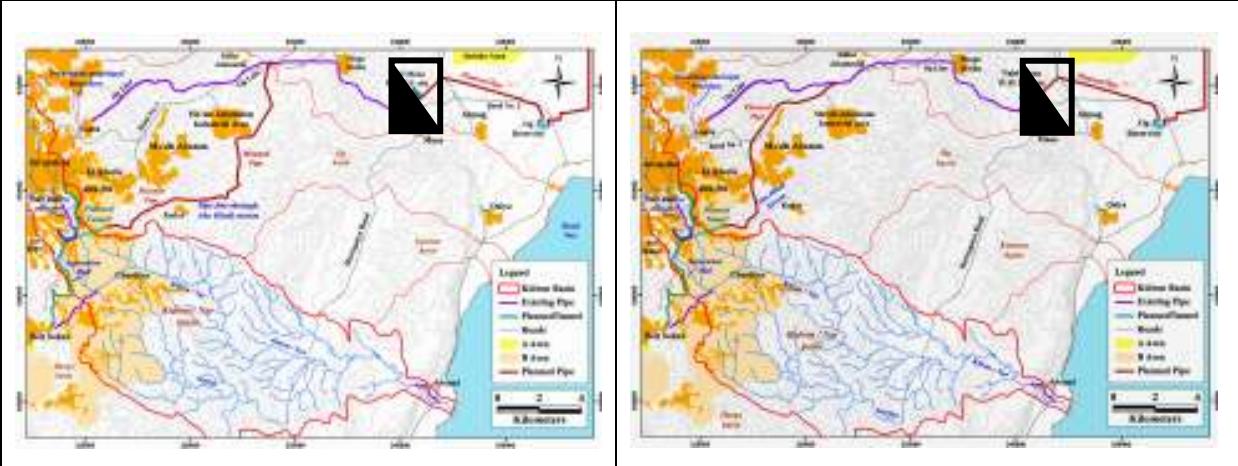
Figure 2: M1: Joint WWTP at Wadi Nar; operated under Palestinian authority



Source: Authors compilation

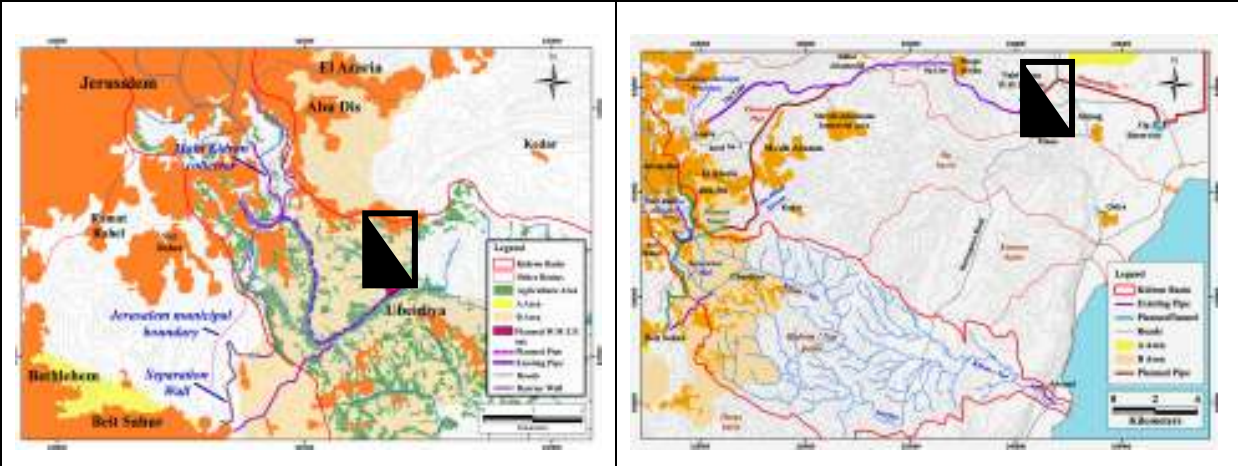
<sup>3</sup> Israel captured East Jerusalem from Jordan in the 1967 Six Day War. and in 1980 the Israeli Knesset passed the "Jerusalem Law" annexing East Jerusalem and offering its residents citizenship. The non – binding United Nations Security Council Resolution 478 has declared this action to be in violation of international law.

Figure 3: M2: Joint WWTP at Nebi Musa, operated under Israeli authority, different transmission routes under discussion



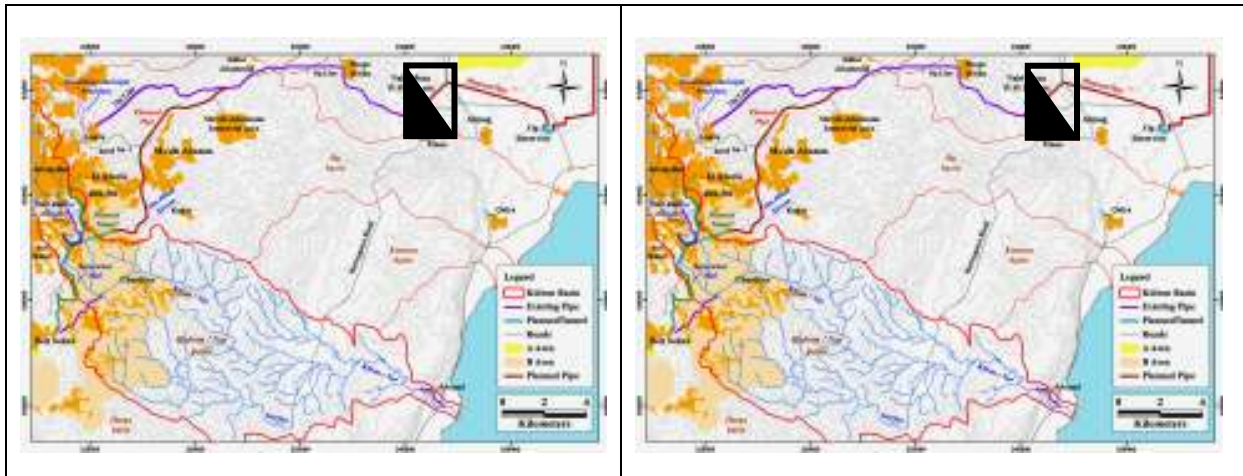
Source: Authors compilation

Figure 4: M3: 2 separate WWTP: Wadi Nar, operated under Palestinian authority and Nebi Musa, operated under Israeli authority



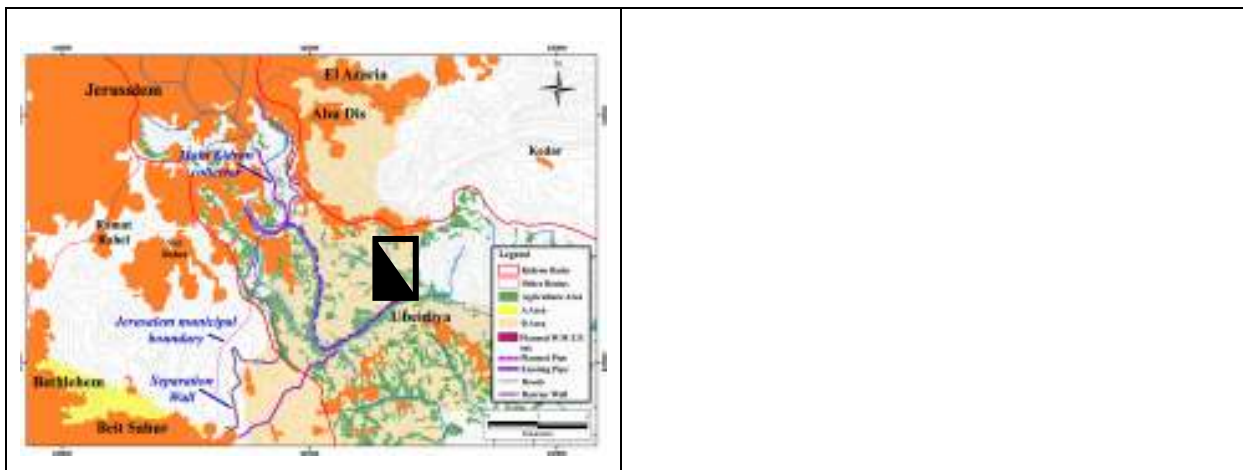
Source: Authors compilation

Figure 5: M4: 2 separate WWTP: Wadi Nar, operated under Palestinian authority and Jerusalem, operated under Israeli authority



Source: Authors compilation

Figure 6: M5: Unilateral WWTP at Wadi Nar, operated under Palestinian authority



Source: Authors compilation



Figure 7: M6: Unilateral WWTP at Nebi Musa, operated by IL (e.g. pumping via Hureqanyia road pipeline)



Source: Authors compilation

## 4 List of stakeholders interviewed

To be added

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