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<http://www.pcbs.gov.ps> :

(970/972) 2 240 6340 :

diwan@pcbs.gov.ps :

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الفصل الثالث

ميزان الطاقة للأراضي الفلسطينية

إن أي نظام لحساب الطاقة يجب أن يعتمد بشكل أساسي على القانون الأول للديناميكا الحرارية والذي ينص على أن كمية الطاقة في أي نظام مغلق ثابتة ولا يمكن أن تزيد أو تقل إلا إذا أدخلت طاقة أو سحبت من ذلك النظام.

إن ميزان الطاقة وبشكل شامل يعتبر مصدرا للاستخدام حيث يعرض (بجدول واحد) المصادر واستخدامات كافة مصادر الطاقة في بلد معين خلال السنة (أو خلال فترة أخرى). إن موازنة كهذه يجب وبالضرورة أن تعبر عن جميع أنواع الطاقة بوحدة عد عمومية لتوضح العلاقة بين المدخلات والمخرجات من صناعات الطاقة التحويلية. إن وحدة الطاقة الشائعة والموصى بها من قبل الأمم المتحدة هي الجول.

1.3 تحضير عناصر ميزان الطاقة

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$$(7) \begin{pmatrix} \pm(6) \\ - (10) \end{pmatrix} = (12) : \begin{pmatrix} : (12) \\ - (11) \end{pmatrix} \begin{pmatrix} \hat{U} & \tilde{O} \\ \tilde{O} & - \end{pmatrix} \quad .(13)$$

$$:(13)$$

$$:(14) \begin{pmatrix} \hat{O} & \hat{O} & \hat{O} & \hat{O} \\ \hat{U} & \tilde{O} & \tilde{O} & \tilde{O} \end{pmatrix}$$

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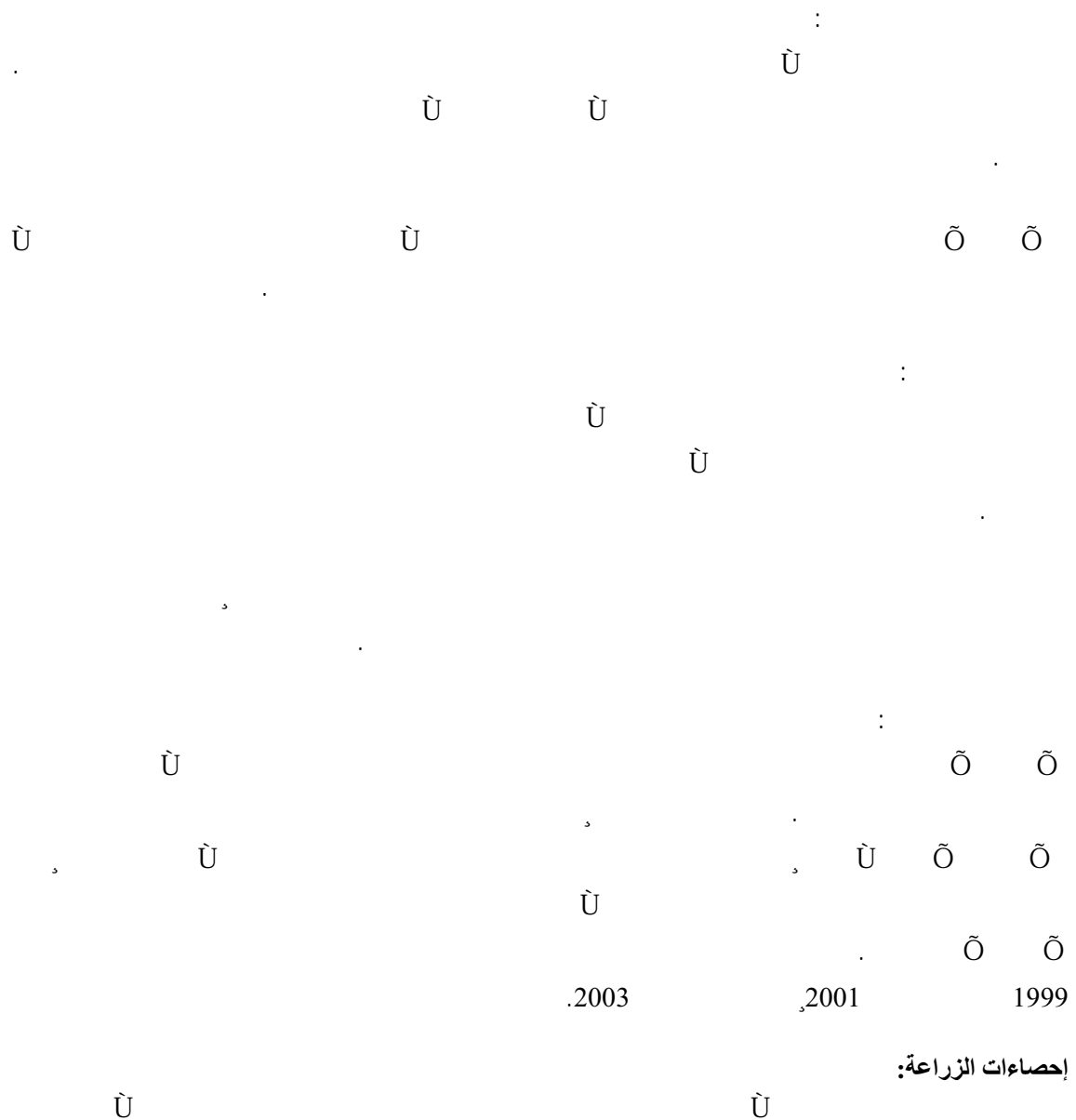
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3.4 تقديرات استهلاك القطاعات الاقتصادية:

تقديرات استهلاك القطاعات الاقتصادية (مليون دينار أردني)

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		0.38925 = (0.135-1) *		* 0.45 =	
	[KWH]	0.38925 * 897,038 * 2,000 * 1.7 =	2001		
	[KWH]	0.38925 * 901,238 * 2,000 * 1.7 =	2002		
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Tables

Table 1: Energy Balance of Palestine in physical units, 2001

Production and Utilization	Energy sources and products			
	()	()	()	()
	Solar Energy (MWh)	Electricity (MWh)	Gasoline (1000 liters)	Kerosene (1000 liters)
1.Primary production	1,187,184.9	-	-	-
2.Imports	.	2,083,182.0	124,041.0	6,081.0
3.Exports	.	-	-36.0	-1.0
4.Bunkers	.	.	.	.
5.Stock change	.	.	218.0	1.0
6.Total energy requirements	1,187,184.9	2,083,182.0	124,223.0	6,081.0
7.Energy converted	..	35,528.0	-74.0	-374.0
8.Electricity generation	..	35,528.0	-74.0	-374.0
9.Heat production	..	..	.	..
10.Consumption for non-energy purposes	..	..	..	..
11.Losses in transport and distribution	-160,270.0	-291,645.5	-0.3	-
12.Statistical differences	-	-222,914.2	-7,543.5	3046.7
13.Final consumption	1,026,914.9	2,049,978.7	131,692.2	2,660.3
14.By industry and construction	..	93,414.0	5,316.0	317.1
15.Mining	..	45,227.0	28.7	-
16.Manufacturing	..	23,271.0	4,610.0	289.1
17.Electricity and water supply	..	22,702.0	53.3	-
18.Construction	..	2,214.0	624.0	28.0
19.By transport	-	14,315.0	118,906.2	45.0
20.Road	-	14,315.0	118,906.2	.
21.Air	-	.	.	.
22.Inland and coastal waterways	.	.	..	.
23.Other	-	-	-	45.0
24.By household and other sectors	1,026,914.9	1,942,249.7	7,470.0	2,298.2
25.Households	1,026,914.9	1,686,938.7	-	1,805.2
26.Agriculture/fishing	..	..	..	..
27.Internal trade	..	178,356.0	5,359.0	389.0
28.Services	..	76,955.0	2,111.0	104.0

- For the data related to wood and coal, the sum was considered excluding production and household, the data is for wood only.
- The technical losses in electricity is considered to be 14%.
- In all data related to transport sector, the transport informal sector is not included.
- The efficiency of the solar water heater was considered to be 45% and the losses in water distribution is 13.5%.
- Data dos not include those parts of Jerusalem, which were annexed by Israel in 1967.

2001

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()	()	(طن)	(طن)	(طن)	
-	-	-	8,861.6	83,964.6	.1
276,173.0	11,796.0	90,899.0	..	3,680.0	.2
-490.0	-386.0	-	..	-1,922.0	.3
.4
26.0	3.0	-1.0	..	6.0	.5
275,709.0	11,413.0	90,898.0	8861.6	85,728.6	.6
-18,570.8	-62.0	-45.0	..	-	.7
-18,570.8	-62.0	-45.0	..	-	.8
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-0.2	-	-0.4	..	-1.0	.11
147,298.9	10,040.9	-46797.3	708.9	734.2	.12
109,839.1	1,310.1	137,649.9	8,152.7	84,993.4	.13
38,237.6	843.1	3,508.4	..	639.8	.14
7,971.6	194.1	33.0	..	-	.15
24,773.7	566.4	3,429.3	..	638.8	.16
1,978.3	39.6	16.1	..	-	.17
3,514.0	43.0	30.0	..	1.0	.18
40,157.4	125.0	37.0	..	36.0	.19
40,157.4	125.020
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-	-	37.0	..	36.0	.23
31,444.1	342.0	134,104.5	8,152.7	84,317.6	.24
6,136.1	-	130,638.5	8,152.7	83,964.6	.25
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19,333.0	264.0	1,584.0	..	17.0	.27
5,975.0	78.0	1,882.0	..	336.0	.28

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Table 2: Energy balance of Palestine in Tera Jules, 2001

Production and Utilization	Total	Energy sources and products				2001					:2
		Solar Energy	Electricity	Gasoline	Kerosene	Diesel	Oils and Lubricants	LPG	Olive cake	Fuel wood	
1.Primary production	5,522.24	4,273.87	-	-	-	-	-	-	148.43	1,099.94	.1
2.Imports	26,645.56	.	7,499.46	4,036.02	212.84	10,211.50	497.08	4,140.45	..	48.21	.2
3.Exports	-60.78	.	-	-1.17	-0.04	-18.12	-16.27	-	..	-25.18	.3
4.Bunkers	..	.	.	.	.	.	.	.	..	.	.4
5.Stock change	8.25	.	.	7.09	0.04	0.96	0.13	-0.05	..	0.08	.5
6.Total energy requirements	32,115.27	4,273.87	7,499.46	4,041.94	212.84	10,194.34	480.94	4,140.40	148.43	1,123.05	.6
7.Energy converted	-578.92	..	127.90	-2.41	-13.09	-686.66	-2.61	-2.05	..	-	.7
8.Electricity generation	-578.92	..	127.90	-2.41	-13.09	-686.66	-2.61	-2.05	..	-	.8
9.Heat production	..	..	..	.	..	..	.	..	..	..	.9
10.Consumption for non-energy purposes	..	..	..	..	..	..	..	..	..	..	.10
11.Losses in transport and distribution	-1,626.94	-576.97	-1,049.92	-0.01	-	-0.01	-	-0.02	..	-0.01	.11
12.Statistical differences	2,818.04	-	-802.48	-245.46	106.63	5,446.36	423.12	-2,131.63	11.87	9.63	.12
13.Final consumption	27,091.37	3,696.90	7,379.92	4,284.98	93.12	4,061.31	55.21	6,269.96	136.56	1,113.41	.13
14.By industry and construction	2,137.92	..	336.29	172.97	11.10	1,413.84	35.53	159.81	..	8.38	.14
15.Mining	468.18	..	162.82	0.93	-	294.75	8.18	1.50	..	-	.15
16.Manufacturing	1,347.45	..	83.78	150.00	9.21	916.01	23.87	156.21	..	8.37	.16
17.Electricity and water supply	159.01	..	81.72	1.74	-	73.15	1.67	0.73	..	-	.17
18.Construction	163.28	..	7.97	20.30	1.89	129.93	1.81	1.37	..	0.01	.18
19.By transport	5,414.31	-	51.53	3,868.95	1.58	1,484.82	5.27	1.69	..	0.47	.19
20.Road	5,353.77	-	.	3,868.95	.	1,484.82	.	.	.	.	.20
21.Air	-	-	.	.	.	.	..	.	.	.	.21
22.Inland and coastal waterways	-	.	-	..	.	..	-	..	.	.	.22
23.Other	60.54	-	51.53	-	1.58	-	5.27	1.69	..	0.47	.23
24.By household and other sectors	19,539.13	3,696.89	6,992.10	243.06	80.44	1,162.65	14.41	6,108.46	136.56	1,104.56	.24
25.Households	17,247.01	3,696.89	6,072.98	-	63.18	226.88	-	5,950.58	136.56	1,099.94	.25
26.Agriculture/fishing	..	..	..	..	..	..	..	..	..	..	/ .26
27.Internal trade	1,628.40	..	642.08	174.37	13.62	714.84	11.12	72.15	..	0.22	.27
28.Services	663.72	..	277.04	68.69	3.64	220.93	3.29	85.73	..	4.40	.28

Table 3: Energy Balance of Palestine in physical units , 2002

Production and Utilization	Energy sources and products			
	() Solar Energy (MWh)	() Electricity (MWh)	() Gasoline (1000 liters)	() Kerosene (1000 liters)
1.Primary production	1,192,743.4	-	-	-
2.Imports	.	2,306,962.0	103,886.0	4,301.0
3.Exports	.	-	-11.0	-
4.Bunkers	-	-	-	-
5.Stock change	.	.	-0.5	18.5
6.Total energy requirements	1,192,743.4	2,306,962.0	103,874.5	4,319.5
7.Energy converted	..	149284.7	-90.1	-29.8
8.Electricity generation	..	149284.7	-90.1	-29.8
9.Heat production	..	..	.	..
10.Consumption for non-energy purposes	..	..	..	..
11.Losses in transport and distribution	-161,020.4	-322,974.7	0	-
12.Statistical differences	-	-4,638.1	-52,886.3	-5,557.9
13.Final consumption	1,031,723.0	2,137,910.1	156,670.7	9,847.6
14.By industry and construction	..	145,412.8	3,325.9	205.3
15.Mining	..	4,831.9	70.0	0
16.Manufacturing	..	120,969.5	2,899.8	203.9
17.Electricity and water supply	..	16,708.4	28.1	0.4
18.Construction	..	2,903.0	328.0	1.0
19.By transport	-	17,018.0	147,239.8	-
20.Road	-	.	147,239.8	.
21.Air	-	.	.	.
22.Inland and coastal waterways	.	-	..	.
23.Other	-	17,018.0	-	-
24.By household and other sectors	1,031,723.0	1,975,479.3	6,105.0	9,642.3
25.Households	1,031,723.0	1,754,830.3	-	9,024.3
26.Agriculture/fishing	..	..	..	..
27.Internal trade	..	164,049.0	4,707.0	214.0
28.Services	..	56,600.0	1,398.0	404.0

- For the data related to wood and coal, the sum was considered excluding production and household, the data is for wood only.
- The technical losses in electricity is considered to be 14%.
- In all data related to transport sector, the transport informal sector is not included.
- The efficiency of the solar water heater was considered to be 45% and the losses in water distribution is 13.5%.
- Data dos not include those parts of Jerusalem, which were annexed by Israel in 1967.

2002

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() Diesel (1000 liters)	() Oils and Lubricants (Tons)	(طن) LPG (Tons)	(طن) Olive cake (Tons)	(طن) Fuel wood and coal (Tons)	
-	-	-	49,825.6	232,529.7	.1
207,078.0	21,128.0	95,336.0	..	3,709.0	.2
-354.8	-10.0	-3.1	..	-	.3
-	-	-	-	-	.4
2.9	-1.9	-8.0	..	-1.7	.5
206,726.1	21,116.1	95,324.9	49,825.6	236,237.0	.6
-46,316.3	-80.0	-8.0	-	-	.7
-46,316.3	-80.0	-8.0	-	-	.8
..	..	..	..	..	.9
..	..	..	..	..	.10
0	0	-0.1	..	-0.20	.11
68,647.9	19,791.7	-62,868.7	2,441.4	2,316.1	.12
91,761.9	1,244.4	158,185.5	47,384.2	233,920.7	.13
32,352.5	780.4	3,596.0	-	869.0	.14
6,984.0	154.4	19.0	-	0	.15
20,541.4	533.7	3,517.4	-	868.0	.16
982.1	10.3	12.6	-	0	.17
3,845.0	82.0	47.0	-	1.0	.18
30,110.7	66.0	26.0	-	-	.19
30,110.7	.	.	.	.	.20
.	.	.	.	.	.21
..	.	-	.	.	.22
-	66.0	26.0	-	-	.23
29,298.7	398.0	154,563.5	47,384.2	233,051.7	.24
11,064.7	.	150,711.5	47,384.2	232,529.7	.25
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13,725.0	326.0	1,813.0	.	13.0	.27
4,509.0	72.0	2,039.0	.	509.0	.28

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Table 4: Energy balance of Palestine in Tera Jules, 2002

Production and Utilization	Total	Energy sources and products				2002					
		Solar Energy	Electricity	Gasoline	Kerosene	Diesel	Oils and Lubricants	LPG	Olive cake	Fuel wood	
1.Primary production	844.108,	4,293.88	-	-	-	-	-	-	834.58	2,976.38	.1
2.Imports	24,772.89	.	8,305.06	3,380.22	150.54	7,656.71	890.33	4,342.55	..	47.48	.2
3.Exports	-14.04	.	-	-0.36	-	-13.12	-0.42	-0.14	..	-	.3
4.Bunkers	-	-	-	.	-	-	-	-	-	-	.4
5.Stock change	0.27	.	.	-0.02	0.64	0.11	-0.08	-0.36	..	-0.02	.5
6.Total energy requirements	32,863.96	4,293.88	8,305.06	3,379.84	151.18	7,643.70	889.83	4,342.05	834.58	3,023.84	.6
7.Energy converted	-1,182.83	..	537.42	-2.93	-1.04	-1,712.55	-3.37	-0.36	-	-	.7
8.Electricity generation	-1,182.83	..	537.42	-2.93	-1.04	-1,712.55	-3.37	-0.36	-	-	.8
9.Heat production	..	..	..	.	..	..	..	..	..	..	.9
10.Consumption for non-energy purposes	..	..	..	..	..	..	..	..	..	..	.10
11.Losses in transport and distribution	-1,742.38	-579.67	-1,162.71	0	-	0	0	0	..	0	.11
12.Statistical differences	-1,352.86	-	-16.7	-1,720.80	-194.53	2,538.26	834.02	-2863.66	40.89	29.66	.12
13.Final consumption	31,291.61	3,714.21	7,696.47	5,097.71	344.67	3,392.89	52.44	7,205.35	793.69	2,994.18	.13
14.By industry and construction	2,042.91	..	523.48	108.21	7.19	1,196.23	32.89	163.80	-	11.11	.14
15.Mining	285.28	..	17.39	2.28	-	258.23	6.51	0.87	-	0	.15
16.Manufacturing	1,490.31	..	435.49	94.35	7.14	759.52	22.49	160.22	-	11.10	.16
17.Electricity and water supply	98.38	..	60.15	0.91	0.01	36.31	0.43	0.57	-	0	.17
18.Construction	168.94	..	10.45	10.67	0.04	142.17	3.46	2.14	-	0.01	.18
19.By transport	5,969.42	-	61.26	4,790.86	-	1,113.34	2.78	1.18	-	-	.19
20.Road	5,904.20	-	.	4,790.86	-	1,113.34	.	.	.	.	.20
21.Air	-	-	.	.	.	.	.	.	.	.	.21
22.Inland and coastal waterways	-	.	-	..	-	..	.	-	.	.	.22
23.Other	65.22	-	61.26	-	-	-	2.78	1.18	-	-	.23
24.By household and other sectors	23,279.27	3,714.20	7,111.73	198.64	337.48	1,083.32	16.77	7,040.37	793.69	2,983.07	.24
25.Households	21,391.54	3,714.20	6,317.39	-	315.85	409.12	.	6,864.91	793.69	2,976.38	.25
26.Agriculture/fishing	..	..	..	..	..	..	..	..	..	..	/ .26
27.Internal trade	1,355.19	..	590.58	153.15	7.49	507.48	13.74	82.58	.	0.17	.27
28.Services	532.54	..	203.76	45.49	14.14	166.72	3.03	92.88	.	6.52	.28

Table 5: Energy Balance of Palestine in physical units, 2003

Production and Utilization	Energy sources and products			
	()	()	()	()
	Solar Energy (MWh)	Electricity (MWh)	Gasoline (1000 liters)	Kerosene (1000 liters)
1.Primary production	1,198,300.6	-	-	-
2.Imports	.	2,315,614.3	102,101.2	4,552.6
3.Exports	.	-	-0.4	-
4.Bunkers	.	.	.	.
5.Stock change	.	.	50.8	-6.1
6.Total energy requirements	1,198,300.6	2,315,614.3	102,151.6	4,546.5
7.Energy converted	..	342,379.6	-128.4	-294.9
8.Electricity generation	..	342,379.6	-128.4	-294.9
9.Heat production	..	..	.	..
10.Consumption for non-energy purposes	..	..	..	..
11.Losses in transport and distribution	161,770.6	-372,119.1	..	..
12.Statistical differences	-	68,056.4	-81,646.3	-14,417.4
13.Final consumption	1,036,530.0	2,217,818.4	183,669.5	18,669.0
14.By industry and construction	..	186,072.3	3,299.0	1,236.1
15.Mining	..	984.7	18.6	0
16.Manufacturing	..	160,241.1	2,723.5	1,136.4
17.Electricity and water supply	..	18,535.0	2.5	46.1
18.Construction	..	6,311.5	554.4	53.6
19.By transport	-	20,008.1	175,387.3	193.1
20.Road	-	.	175,387.3	.
21.Air	-	.	.	.
22.Inland and coastal waterways	.	.	..	.
23.Other	-	20,008.1	-	193.1
24.By household and other sectors	1,036,530.0	2,011,738.0	4,983.2	17,239.8
25.Households	1,036,530.0	1,822,722.1	-	16,306.8
26.Agriculture/fishing	..	..	..	..
27.Internal trade	..	130,959.9	3,611.7	644.4
28.Services	..	58,056.0	1,371.5	288.6

2003

:5

	()	()	(طن)	(طن)	(طن)	
	-	-	-	17,829.2	381,094.5	.1
	282,796.9	1,490.9	88,946.4	..	35.4	.2
	-	-142.2	-	..	-0.9	.3
	.	.	.	..	.	.4
	1273.2	29.3	14.3	..	1.9	.5
	284,070.1	1,378.0	88,960.7	17,829.2	381,130.9	.6
	-131,465.3	-86.1	-81.7	..	-	.7
	-131,465.3	-86.1	-81.7	..	-	.8
	..	.	..	..	..	.9
	..	..	..	..	..	.10
	-12.2	-0.5	-0.7	..	..	.11
	45,506.5	-454.0	-89,933.4	1,248	-922.3	.12
	107,086.1	1,745.4	178,811.7	16,581.2	382,053.2	.13
	34,602.6	922.3	2,700.3	..	336.5	.14
	4,017.5	84.1	32.7	..	0	.15
	24,044.4	738.5	2,633.1	..	336.5	.16
	2,014.6	19.6	11.2	..	0	.17
	4,526.1	80.1	23.3	..	0	.18
	30,338.1	112.2	36.9	..	0.1	.19
	30,338.1	.	.	.	.	.20
	.	.	.	.	.	.21
	..	..	..	.	.	.22
	-	112.2	36.9	..	0.1	.23
	42,145.4	710.9	176,074.5	16,581.2	381,716.6	.24
	16,393.5	-	171,568.3	16,581.2	381,094.5	.25
	..	..	..	..	..	.26
	22,133.5	485.7	1,524.1	..	157.3	.27
	3,618.4	225.2	2,982.1	..	464.8	.28

- For the data related to wood and coal, the sum was considered excluding production and household, the data is for wood only.
- The technical losses in electricity is considered to be 14%.
- In all data related to transport sector, the transport informal sector is not included.
- The efficiency of the solar water heater was considered to be 45% and the losses in water distribution is 13.5%.
- Data does not include those parts of Jerusalem, which were annexed by Israel in 1967.

Table 6: Energy balance of Palestine in Tera Jules, 2003

Production and Utilization	Total	Energy sources and products				2003					
		Solar Energy	Electricity	Gasoline	Kerosene	Diesel	Oils and Lubricants	LPG	Olive cake	Fuel wood	
1.Primary production	9,452.42	4,313.88	-	-	-	-	-	-	298.64	4,839.90	.1
2.Imports	26,388.91	.	8,336.21	3,322.15	159.34	10,456.42	62.83	4,051.51	..	0.45	.2
3.Exports	-6.01	.	-	-0.01	-	-	-5.99	-	..	-0.01	.3
4.Bunkers	0	.	.	.	.	.	.	.	..	.	.4
5.Stock change	50.41	.	.	1.65	-0.21	47.07	1.23	0.65	..	0.02	.5
6.Total energy requirements	35,885.73	4,313.88	8,336.21	3,323.79	159.13	10,503.49	58.07	4,052.16	298.64	4,840.36	.6
7.Energy converted	-3,650.21	..	1,232.57	-4.18	-10.32	-4,860.93	-3.63	-3.72	..	-	.7
8.Electricity generation	-3,650.21	..	1,232.57	-4.18	-10.32	-4,860.93	-3.63	-3.72	..	-	.8
9.Heat production	..	..	..	.	..	..	.	..	..	..	.9
10.Consumption for non-energy purposes	..	..	..	..	..	..	..	..	..	..	.10
11.Losses in transport and distribution	-1,922.50	-582.37	-1,339.63	..	..	-0.45	-0.02	-0.03	..	..	.11
12.Statistical differences	-5,340.00	-	245.00	-2,656.59	-504.60	1,682.60	-19.14	-4,096.46	20.90	-11.71	.12
13.Final consumption	35,653.02	3,731.51	7,984.15	5,976.20	653.41	3,959.51	73.56	8,144.87	277.74	4,852.07	.13
14.By industry and construction	2,266.03	..	669.86	107.34	43.26	1,279.43	38.87	123.00	..	4.27	.14
15.Mining	157.73	..	3.54	0.61	0.00	148.55	3.54	1.49	..	0	.15
16.Manufacturing	1,749.63	..	576.87	88.62	39.77	889.04	31.12	119.94	..	4.27	.16
17.Electricity and water supply	144.25	..	66.73	0.08	1.61	74.49	0.83	0.51	..	0	.17
18.Construction	214.43	..	22.72	18.04	1.88	167.35	3.38	1.06	..	0	.18
19.By transport	6,913.67	-	72.03	5,706.72	6.76	1,121.75	4.73	1.68	..	0	.19
20.Road	6,828.47	.	.	5,706.72	.	1,121.75	.	.	.	.	.20
21.Air	.	-	.	.	.	.	.	.	.	.	.21
22.Inland and coastal waterways	..	.	.	..	.	..	..	..	.	.	.22
23.Other	85.20	-	72.03	-	6.76	-	4.73	1.68	..	0	.23
24.By household and other sectors	27,425.51	3,731.51	7,242.26	162.15	603.39	2,510.51	29.96	8,020.19	277.74	4,847.80	.24
25.Households	25,354.96	3,731.51	6,561.80	-	570.74	1,558.33	-	7,814.94	277.74	4,839.90	.25
26.Agriculture/fishing	..	..	..	..	..	..	..	..	..	..	/ .26
27.Internal trade	1,521.81	..	471.46	117.52	22.55	818.39	20.47	69.42	..	2.00	.27
28.Services	548.74	..	209.00	44.63	10.10	133.79	9.49	135.83	..	5.90	.28

Annexes

1: Ø

Annex 1: Fuel equivalents from metric tons into giga joules

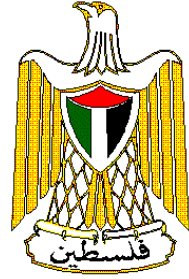
Metric tons	Ø Giga joules	
Olive cake	16.75	الجفت
Charcoal	28.89	
Fuel wood	12.60	
LPG	45.55	Ù Ù
Gasoline	43.97	
Kerosene	43.21	
Diesel	42.50	
Lubricating oil	42.14	
Bitumen	41.80	

2: .

م³

Annex 2: Specific weights for different petroleum products. Ton/M³

Fuel	Volume equivalent	
Olive cake	1.00	الجفت
Charcoal	1.00	
Fuel wood	1.00	
LPG	0.54	Ù Ù
Gasoline	0.74	
Kerosene	0.81	
Diesel	0.87	
Lubricating oil	0.90	
Bitumen	1.04	



Palestinian Central Bureau of Statistics

Energy Balance in Palestine 2001, 2002, 2003

June, 2005

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All correspondence should be directed to:

Dissemination and Documentation Department/Division of user services

Palestinian Central Bureau of Statistics

P.O.Box 1647 Ramallah, Palestine.

Tel: (972/970) 2 240 6340

E-Mail: diwan@pcbs.gov.ps

Fax: (972/970) 2 240 6343

web-site: <http://www.pcbs.gov.ps>

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Team Work

- **Report Preparation**
Abdullah Azzam
- **Preliminary Review**
Marwan Barakat
Ammar Abduh
Mahmoud Abd Al-Rahman
Mahmoud Jaradat
Dr. Maher Khammash (Local Consultant/An-Najah National University)
- **Final Review**
Luay Shabaneh President

Preface

Most countries pay special attention for providing statistics on energy due to the important role of energy in reflecting the situation of the infrastructure, economic situation and the level of living standards of a society. In Palestine, additional special attention is given due to the shortage of natural resources, the high cost of energy and the high population density. All these factors create a need for comprehensive and high quality statistics covers the need of data users of decision makers and researchers on this field of study. And to give amore comprehensive picture about production, conversion and consumption of all kinds of fuels in the country the idea of the energy balance that covers all these elements in one table was created

PCBS is very pleased to introduce the first publish of the Palestinian energy balance for the years 2001, 2002, 2003 through a series of energy balances supposed to be published for various years. This report is considered to be a collective summary of the available data from the activities and surveys conducted by PCBS that the results of the statistical economic surveys series, household energy survey and the data presented by the foreign trade statistics and prices statistics were used.

This report presents statistical data on the basic indicators related to energy consumption in different economic activities. Also, the report provides data on the consumption of energy in the domestic sector in the Palestinian territory including the consumption, conversion and utilization of all kinds of fuels.

PCBS hopes that the results of this report will contribute to provide necessary data needed for developing energy situation in the different sectors and raising the consumption efficiency in these sectors, and to light the way for the decision makers in the national comprehensive developing movement.

June, 2005

**Luay Shabaneh
President**

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Chapter One

Introduction

Energy plays an important role in peoples level of living that is the presence of energy is considered to be one of the main elements in welfare and the level of living for citizens. Also it is considered to be an indicator to the economical situation of the country, and so most official statistical bureaus in different countries pay attention in gathering, classifying and publishing statistics specialized in energy subject. And to have amore comprehensive picture upon energy flow in the country the energy balance is performed which reflects the energy performance in the country.

The idea of the energy balance aroused in 1978 through the statistical division of the United Nations. The main purpose of the energy balance is to show (in one table) the over all picture of energy production, conversion and consumption for each fuel utilized in the country.

The data of this report is based on the administrative records and the data extracted from surveys conducted by the Palestinian Central Bureau of Statistics (PCBS). This data was gathered and processed to prepare this report to cover energy production, conversion and consumption for each fuel utilized in the country in years 2001, 2002, 2003.

This report is considered to be an accomplishment of the energy statistics program and a step by which to focus the light on the energy situation in the Palestinian territory in the absence of the accurate and comprehensive data a bout this sensitive and essential subject. Some of the gaps in this report will be over looking through cooperation with the administrative records providers and the survey conductor taking into consideration the importance of providing a comprehensive and accurate data about this subject.

1.1 Report Aims:

This report aims to present a statistical data about the main indicators related to energy in the Palestinian territory that this report is to achieve especially the following:

1. Covering energy production, conversion and consumption for each fuel in different sectors in one table.
2. Provides necessary data for research and analysis purposes.
3. Provides necessary data for policy makers and interested persons in energy field.

The report provides data on the following indicators:

1. Imported and re-exported energy in the Palestinian Territory by type of energy.
2. Energy consumed by deffirent sectors by type of energy.
3. Energy used for Electricity generation in economic sectors by type of energy.
4. Energy losses and stock change for different types of energy.
5. Energy consumption in the sectors of economy, household and agriculture.

1.2 Report Structure:

This report is divided into five chapters; the first chapter contains the introduction, aims and the structure of the report. The second chapter contains the concepts and definitions in this report. The third chapter presents the energy balance components and the final shape of the Palestinian territory energy balance . The fourth chapter explains the methodology of this report according to the methodology of the surveys and the administrative records which was considered to be as sources of this report, also it explains the methodology of calculating the estimations. The fifth chapter handles data quality through spreading the main notes on the data and estimations of the data sources of this report.

Concepts and Definitions

Hard Coal:	Coal with a high degree of coalification, with a gross calorific value above 23 865 kJ/kg (5 700 kcal/kg) on an ash-free but moist basis, and with a reflectance index of vitrinite of 0.5 and above. Slurries, middling and other low-grade coal products, which cannot be classified according to the type of coal from which they are obtained, are included under hard coal.
Natural Gas Liquids (NGL):	Liquid or liquefied hydrocarbons recovered from natural gas in separation facilities or gas processing plants. NGL's include, but are not limited to, ethane, propane, pentane, natural gasoline and plant condensate.
Motor Gasoline:	Motor gasoline consists of a mixture of light hydrocarbons distilling between 35°C and 200°C. It is used as a fuel for internal combustion engines such as motor vehicles, excluding aircraft.
Gasoline-Type Jet Fuel:	This includes all light hydrocarbon oils for use in aviation turbine power units, distilling between 100°C and 250°C. They are obtained by blending kerosene and gasoline or naphthas in such a way that the aromatic content does not exceed 25% in volume. Additives are included to reduce the freezing point to -58°C and the vapor pressure is between 13.7kPa and 20.6kPa.
Kerosene-Type Jet Fuel:	Medium oil with the same distillation characteristics and flash point as kerosene, with a maximum aromatic content of 20% in volume. It is treated to give a kinematic viscosity of less than 15 CST at -34°C and a freezing point below -50°C.
Kerosene:	Medium oil distilling between 150 300°C. Its specific gravity is around 0.80 and the flash point above 38°C. It is used in sectors other than aircraft transport.
Gas/Diesel Oil (Distillate Fuel Oil):	Heavy oil distilling between 200°C and 380°C. Its flash point is always above 50°C, and its specific gravity is higher than 0.82.
Lubricants:	Viscous, liquid hydrocarbons rich in paraffin waxes, distilling between 380°C and 500°C, obtained by vacuum distillation of oil residues from atmospheric distillation. Its flash point is greater than 125°C, an ash content less than or equal to 0.3% and water content less than or equal to 0.2%.
Petroleum Coke:	Black solid residue obtained by cracking and carbonization in furnaces. It consists mainly of carbon (90 to 95%) and burns without leaving any ash.
Liquefied Petroleum Gases (LPG):	Hydrocarbons, which are gaseous under conditions of normal temperature and pressure but are liquefied by compression or cooling to facilitate storage, handling and transportation. They consist mainly of propane (C ₃ H ₈) and butane (C ₄ H ₁₀) or a combination of the two.

Fuel Wood:	All wood in the rough used for fuel purposes.
Animal Wastes:	Excreta of cattle, horses, pigs, poultry etc., and (in principle) excreta of humans, used as a fuel.
Vegetal wastes:	Mainly crop residues and food processing wastes used for fuel. Bagasse is excluded.
Biogas:	A by-product of the fermentation of biomass, Principally animal wastes, by bacteria. It consists mainly of methane gas and carbon dioxide.
Charcoal:	The solid residue, consisting mainly of carbon, obtained by the destructive distillation of wood in the absence of air.
Joule Unit:	Energy unit, it is defined as the energy resulting from the movement of a one-Newton body to a distance of one meter.
Mega Watt-Hour:	Energy unit, a 1 MWh = 10^6 Watt \times 3600 Second = 3.6×10^9 Watt-second Other prefixes are used for referring to the multiplications of the units, Kilo = 10^3 , Giga = 10^9 and Tera = 10^{12} .
Solar Energy:	The energy from the sunrays that are used for heating, electricity generation, drying and other forms.
Olive Cake:	The olive cake (jeft) is the olive solid remainder after the olive pressing.

A set of special symbols was used in the tables of this book. The representation of these symbols are:

(-)	Nil
(0)	Less than half of the unit
(.)	Category not applicable
(..)	Data not available
MWh	Mega-Watt.hour

Energy Balance for the Palestinian Territory

Any system of energy accounts should be based firmly on the first law of thermodynamics, which states that the amount of energy within any closed system is fixed and can be neither increased nor diminished unless energy is brought into or sent out from that system.

An over all energy balance is a supply and use account that shows (ideally in a single table) the origins and uses of all sources of energy used in a given country during the year (or maybe another time period). Such a balance must necessarily express all forms of energy in a common accounting unit, and will show the relationship between the inputs to and the outputs from the energy transformation industries. The common energy unit recommended by the United Nations for general application is the joule.

3.1 Preparation of Energy Balance Components:

The energy balance table consists of 9 columns of data for individual or groups of fuels, and 28 rows identifying the different categories of production, conversion and utilization of energy.

3.2 Description of the Rows:

Primary Production (row 1): Report the quantities of fuels extracted or produced, calculated after any operation for removal of inert matter. In general, production includes the quantities consumed by the producer in the production process as well as supplies to other producers of energy for transformation or other uses.

Imports (row 2) and **Exports** (row 3): Report the quantity of fuels obtained from or supplied to other countries. Amounts are considered as imported or exported when they have crossed the political boundary of the country, whether customs clearance has taken place or not. The amount of fuels in transit should not be included. In the energy balance format, imports are positive numbers, and exports are negative numbers and carry a negative sign (-).

Bunkers (row 4): Refer to the amount of fuels delivered to ocean-going ships or aircrafts of all flags engaged in international traffic. Consumption by ships engaged in transport in inland and coastal waters, or by aircraft engaged in domestic flights, is not included. The minus sign is used for entries under this item.

Stock Change (row 5): Report the difference between the opening stock level and closing stock level for stocks held on national territory. A stock build is shown as a negative number and a stock draw is shown as a positive number.

Total Energy Requirements (row 6): it is computed as: (6) = **production** (row 1) + **imports** (row 2) - **exports** (row 3) - **bunkers** (row 4) ± **stock changes** (row 5)

Energy converted (row 7): This sector represents quantities of fuels transformed to obtain derived energy products.

Consumption for Non-Energy Uses (row 10): It refers to the quantity of energy products consumed as raw materials in the chemical, petrochemical and other industries, not in order to produce energy. The minus sign is used for entries under this item.

Losses in Transport and Distribution (row 11): It refers to the losses of fuels and electrical energy, which occur outside the utilities or plants before reaching the final consumer. The losses carry a minus sign.

Statistical Differences (row 12): It is calculated as follows: (12) = total energy requirements (row 6) \pm energy converted (row 7) – losses in transport and distribution (row 11) – consumption for non-energy uses (row 10) – final consumption (row 13).

Final Consumption (row 13): It refers to the consumption of primary and derived energy by industry, construction, transports, households, agriculture and other sectors.

Consumption by Industry and Construction (row 14): It is broken down into the iron and steel industry, chemical industry and other industries and construction. Consumption in the chemical industry refers to use as fuel only. Fuels used by the energy sector, and all inputs into energy conversion, such as fuels used by industrial/self producers of thermal electricity, are excluded.

Consumption by Transport (row 19): It includes all fuels consumed by road traffic, by ships engaged in transport in inland and coastal waters and aircraft engaged in domestic flights, and by rail ways. Fuels consumed by agricultural equipment are included in agricultural consumption. Fuel consumption in the communication sector and in the transport establishments is included under the item other (row 23).

Consumption by Households and Other Sectors (row 23): It covers households, agriculture (including hunting, forestry and fishing), and trade and service sectors.

3.3 Description of the Columns

Column (1): It consists of charcoal and fuel wood.

Column (2): It consists of olive cake.

Column (3): It consists of liquefied petroleum gas.

Column (4): It consists of oils and lubricants.

Column (5): It consists of diesel.

Column (6): It consists of kerosene.

Column (7): It consists of gasoline.

Column (8): It consists of electricity.

Column (9): It consists of solar energy.

Chapter Four

Methodology

This section presents a documentation of the main characteristics of the methodology used in preparing this report and the methodology used in data collection from the different sources, which includes the economic surveys series, foreign trade statistics, prices statistics and the household energy survey.

4.1 Preparing Report Methodology:

In the absence opportunity of implementing inclusive survey for energy, and because the administration records do not include the whole Palestinian territory in this subject, we depended on the surveys run by the PCBS to bring the data of energy in preparing this report, and the data covers the following forms of energy:

1. Electricity.
2. Petroleum products: diesel, gasoline, kerosene, oils and lubricants and LPG.
3. Coal, wood and olive cake.
4. Solar energy.

The energy balance for the Palestinian territory was prepared in two forms; the first one is in physical units while the second one is in Joule. International energy conversion factors were used following the United Nations recommendations to convert the different types of energy into a common energy unit (Joule).

The foreign trade statistics has provided the import and re-export data of energy forms, while the economic surveys provided data about the value of the purchases, energy used in production, stock change, energy used in generating Electricity and losses in the different economical activities. The department of prices statistics provided the average consumed price for the different energy forms.

4.2 Data Sources

Economic Surveys 2001, 2002, 2003:

The main objective of these surveys is to collect data on the basic economic indicators covering the main economic activities (industry, internal trade, service, transport, storage and communication and construction). Data related to production inputs of goods were used to provide data on energy purchases, energy used in production, energy used in generating electricity and losses in the different economical activities.

Foreign Trade Statistics:

The main objective of the foreign trade statistics is to cover data related to flowing of goods to the Palestinian Territory. Foreign trade statistics data were used to obtain data related to the imports and re-exports of the different energy types.

Prices Statistics:

PCBS through prices statistics program is gathering data about the consumer prices depending on a complete system covers the whole sides from the ways of gathering prices, resources and its geographical distribution.

The prices data are gathered in the field through personal interview by a trained team for this purpose, and this is from the sub-sellers shops and the different service shops from the main cities of the Palestinian Territory.

Household Energy Survey:

The PCBS provides data that cover the needs of data users about energy consumption and the forms of such energy in this sector, and to cover this data a questionnaire of the household energy survey was connected with the labor force survey, which is run by the PCBS in a quarter manner. The questionnaire contains questions about the consumption amounts and forms of energy; this questionnaire also includes questions about the use of energy forms in the household activities and the equipments that consume energy in the household sector. The PCBS performed two rounds of the household energy survey in year 1999 and a third round in year 2001, and a two rounds in year 2003.

Agriculture Statistics:

It provides the amount of pressed olives and through which the amount of olive cake is estimated.

4.3 Consumption Estimations of the Economic Sectors:

The statistical tables of the energy forms for the economical indicators were requested and these indicators are:

1. The value of purchases from the mentioned energy forms (Electricity, Petroleum products, Coal and wood).
2. The value used in production from the mentioned energy forms.
3. The value of stock change and losses from the mentioned energy forms.
4. The value used in electricity generation from the mentioned energy forms.

These indicators are asked for through the economic surveys and the data processing is performed that is changing the sample numbers into numbers presents the whole frame through weighting equilibrium. The value of the stock change is estimated through subtracting the stock at the end of the year from the value of the stock at the beginning of the year.

4.4 Solar Energy Estimations:

In estimating the solar energy in water heating the following are to be considered:

1. The surface area of the plate of the solar heater is considered to be 1.7 m².
2. The annual incident solar irradiance is about 2,000 KWh/m².
3. The number of the plates for the years 2001, 2002 and 2003 was estimated to be 897,038, 901,238 and 905,437 respectively.
4. The efficiency of the solar water heater was considered to be 45% and the losses in water distribution is 13.5%.
5. The annual heat production from the solar energy for consumption is calculated as;

$$E_{out} = 0.45 * E_{inp} * (1 - 0.135) = 0.38925 E_{inp}$$

$$\text{Heat production in year 2001} = 1.7 * 2,000 * 897,038 * 0.38925 \text{ [KWH].}$$

$$\text{Heat production in year 2002} = 1.7 * 2,000 * 901,238 * 0.38925 \text{ [KWH].}$$

$$\text{Heat production in year 2003} = 1.7 * 2,000 * 905,437 * 0.38925 \text{ [KWH].}$$

Chapter Five

Data Quality

This section provides the most important points concerning the statistical quality of the Palestinian Territory energy balance depending on the calculations of the data quality for the surveys and the administration records that were used as sources for this report, in addition to special technical notes, which should be taken into consideration.

This chapter is divided into two sections, the first one presents data quality according to the sources, the second section presents the special technical points concerning the energy balance of the Palestinian territory.

5.1 Data Sources:

Foreign Trade Statistics:

The program of the foreign trade statistics has many strong points in the Methodology and data processing that are consistent with the international standards and recommendation. The foreign trade statistics in the Palestinian territory include all goods that are imported or exported. The power points of the foreign trade statistics lays in that it provides with real number gathered through total counting of data and so the number does not stand on estimations. But it is worth mentioning the following important notes:

1. Data excludes the quantities entered the Palestinian Territory in illegal cases.
2. Data does not cover the quantities that are not included in interchange between Israel and the Palestinian National Authority (about 20% of the total interchange according to Ministry of Finance).
3. For Petroleum Products, administrative records of General Petroleum Corporation covers the major part of data related to imports, the other part is covered by value added tax invoices from Ministry of Finance.
4. For electricity data, administrative records of Palestinian Energy Authority were used to provide data on electricity imports in Gaza Strip. In West Bank, data were compiled from the electricity value added tax invoices for the local communities from Ministry of Finance. The data does not cover those parts of Jerusalem, which were annexed by Israel in 1967.

Economic Surveys 2001, 2002, 2003:

Through dealing with data from economic surveys, the following notes should be taken into consideration:

1. The response rate of data for this survey is relatively high if it is compared with the response in other countries. There are some rejection states which affect the accuracy of data especially in cases were the rejected establishment have an important weight in its economic activity.
2. All data depends on the establishment records, and if these records were not available and that is for small establishments in most cases, the respondent was asked to give approximate estimates.
3. There were many difficulties during data collection in Jerusalem because of the special political situation of the city, which affects the response rate and data accuracy.

Household Energy Surveys:

Through dealing with data from household energy surveys, the following notes should be taken into consideration:

- There are sampling errors as a result of studying a part of the society and not all of it, and non sampling errors through that some of the households were not in their houses and the interviewers couldn't meet them, some of the households didn't show attention toward the questionnaire, Some errors occurred due to the way the questions were asked by interviewers, misunderstood of the questions by the respondents and answering the questions related to consumption by making estimations.
- This survey is implemented twice a year (January and July) and the data is estimated according to the results of these two months.

5.2 Special Technical Notes:

- 1) The energy balance of the Palestinian Territory covers the imports and re-exports of all kinds of energy in the Palestinian Territory excluding those parts of Jerusalem, which were annexed by Israel in 1967.
- 2) The balance table covers data related to the main types of energy (electricity, petroleum products, biomass and solar energy). It is important to note that there are other types of energy (coke, other petroleum products, animal and vegetal residues and electricity generation from wind and solar energies) that are not included due to the lack of data, and rarity of such energies.
- 3) In calculating the household consumption for 2002, the average consumption of the years 2001 and 2003 was considered because the household energy survey was not implemented in year 2002.
- 4) The technical losses in electricity in the Palestinian Territory are considered to be 14% based on the Palestinian energy and environment research center.
- 5) In all data related to transport sector, the transport informal sector is not included according to the definition.
- 6) In all calculations related to Gasoline, we deal with the average of all available types of Gasoline. Also, a common price and conversion factor were used.
- 7) In all calculations related to oils and lubricants, we deal with the average of all available types of oils and lubricants. Also, a common price and conversion factor were used.
- 8) In all calculations related to wood and coal, a convenient conversion factor was taken for each year according to the quantities.
- 9) The efficiency of the mirror of the solar water heater and the factor of the losses in water distribution were taken from the Palestinian energy and environment research center.
- 10) The amount of olive cake was considered to be 40% of the pressed olives.
- 11) The ton unit in the tables refers to a metric ton.

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