



Progress on the Implementation by Bahrain of GOAL 6 of the SUSTAINABLE DEVELOPMENT GOALS 2030



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6 CLEAN WATER AND SANITATION



Achieve universal and equitable access to safe, affordable drinking water and adequate sanitation and hygiene for all



Overview



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SDG GOAL 6: Concept and Key Objectives

SDG GOAL 6: Ensure Availability and Sustainable Management of Water and Sanitation for All

Key Objectives

- Improve access to **drinking water and sanitation** in developing countries.
- Encourage **responsible** water consumption practices and **achieve equitable access**.
- Protect water catchment areas and **water-related ecosystems**.
- Promote **integrated water resources management (IWRM)**.
- Promote technical and financial **cooperation and support** at international levels.



SDG GOAL 6: Targets and Indicators

SDG Goal 6 Targets

- Six technical targets.
- Two means of implementation targets.

SDG Goal 6 Indicators

- Nine core indicators to monitor the technical targets.
- Two additional indicators to monitor each of the means of implementation targets.



SDG GOAL 6: Targets and Indicators

SDG Goal 6: Ensure Availability and Sustainable Management of Water and Sanitation for All

SDG Goal 6 Targets	Type	SDG Goal 6 Indicators	Type
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	Technical Targets	6.1.1 Proportion of population using safely managed drinking water services	Core Indicators
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation , paying special attention to the needs of women and girls and those in vulnerable situations		6.2.1 Proportion of population using safely managed sanitation services , including a handwashing facility with soap and water	
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally		6.3.1 Proportion of wastewater safely treated	
		6.3.2 Proportion of bodies of water with good ambient water quality	
6.4 By 2030, substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity		6.4.1 Changes in water use efficiency over time	
		6.4.2 Level of water stress : freshwater withdrawal as a proportion of available freshwater resources	
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate		6.5.1 Degree of integrated water resources management implementation (0 – 100)	
		6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	
6.6 By 2020, protect and restore water-related ecosystems , including mountains, forests, wetlands, rivers, aquifer and lakes		6.6.1 Change in the extent of water-related ecosystems over time	

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SDG GOAL 6: Targets and Indicators



SDG Goal 6: Ensure Availability and Sustainable Management of Water and Sanitation for All

SDG Goal 6 Targets	Type	SDG Goal 6 Indicators	Type
<p>6.a By 2030, expand international cooperation and capacity-building support to developing countries in water-and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies</p>	Means of Implementation Targets	<p>6.a.1 Amount of water-and sanitation-related official development assistance that is part of a government coordinated spending plan</p>	Additional Indicators
<p>6.b Support and strengthen the participation of local communities in improving water and sanitation management</p>		<p>6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management</p>	

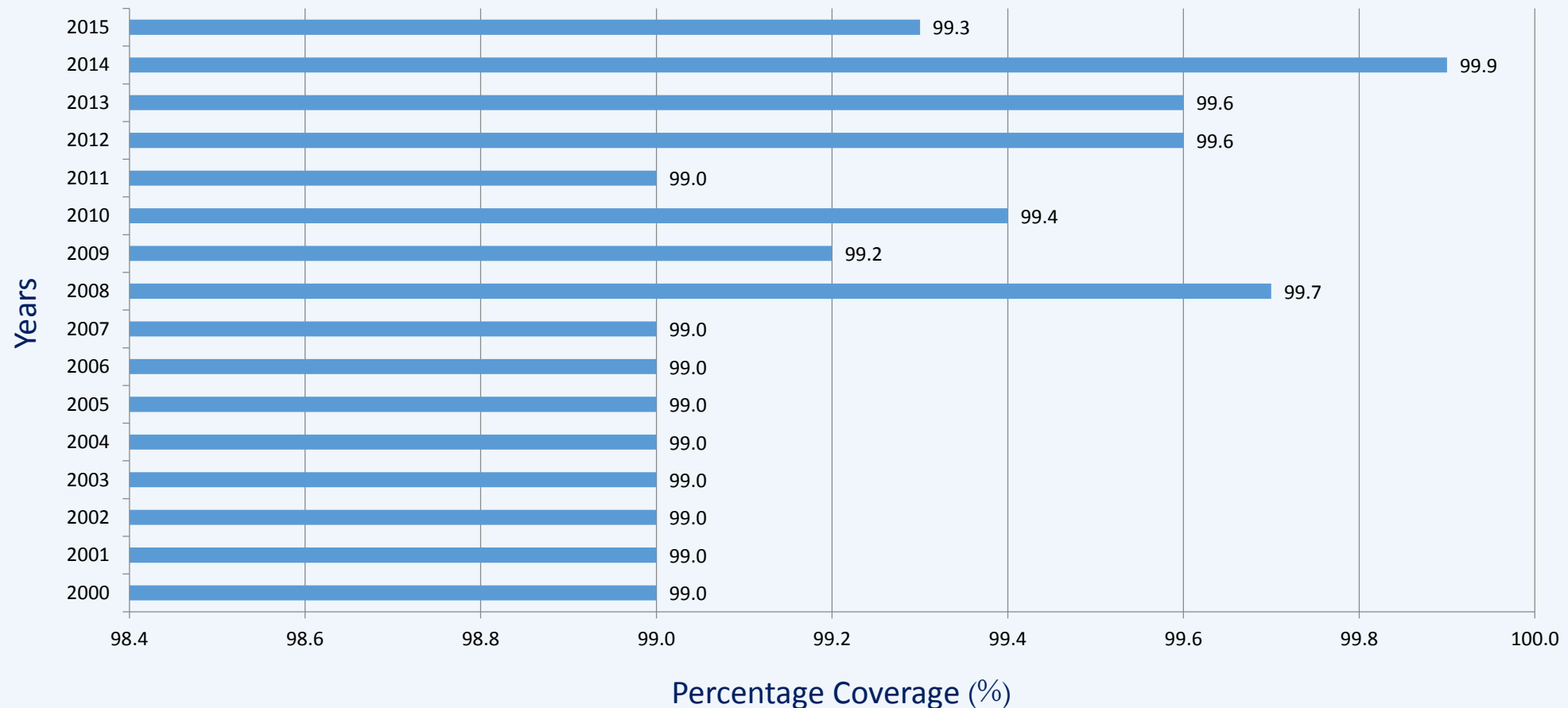


SDG GOAL 6: Targets Monitoring and Progress Achieved



■ The Technical Targets and Core Indicators

Indicator 6.1.1 Proportion of population using safely managed drinking water services

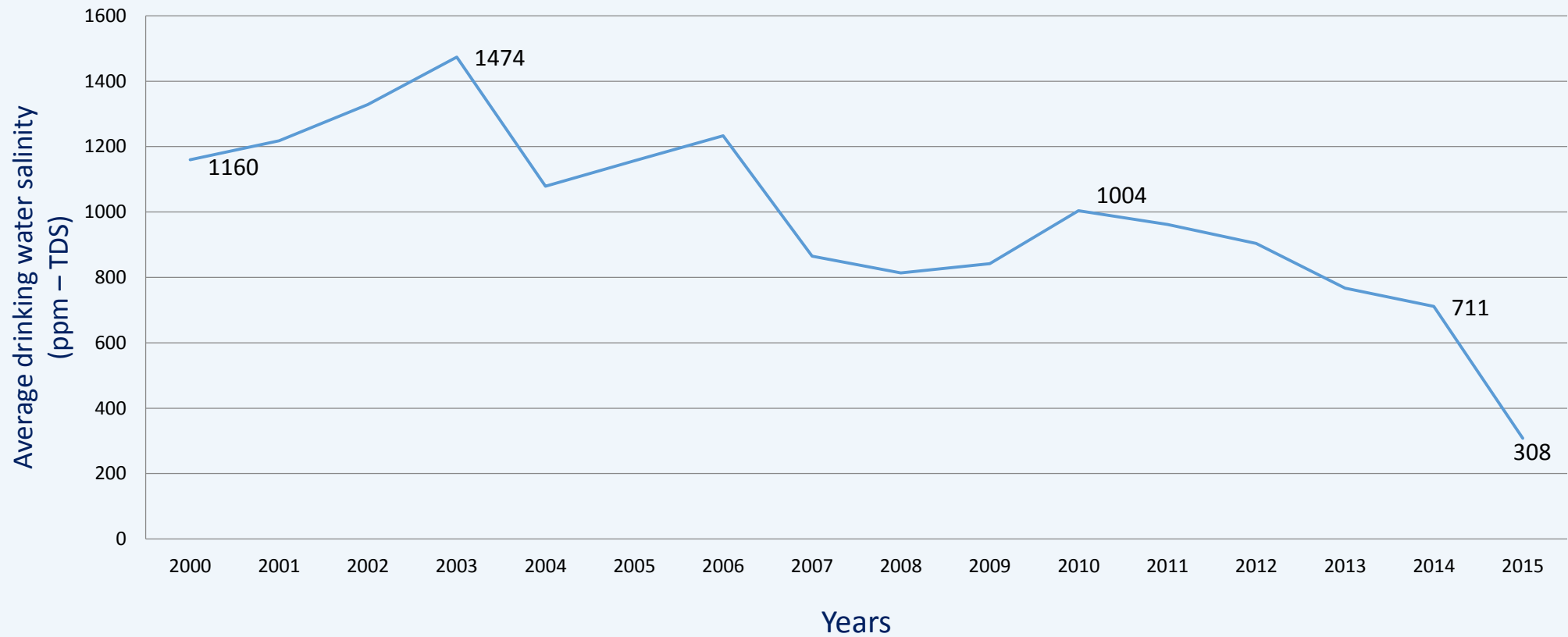




SDG GOAL 6: Targets Monitoring and Progress Achieved



Indicator 6.1.1 Proportion of population using safely managed drinking water services (chemical drinking water quality)





SDG GOAL 6: Targets Monitoring and Progress Achieved

Indicator 6.1.1 Proportion of population using safely managed drinking water services (microbiological drinking water quality)

MONTH	2000		2001		2002		2003		2004		2005		2006		2007	
	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %
JAN	569	1	359	1	446	2	483	1	647	2	368	1	340	1	415	0
FEB	630	0	426	0.23	507	1.57	338	3.55	496	0.2	377	0.53	548	0.91	376	0.53
MAR	529	0.56	366	0.27	434	2.3	383	0	692	0.14	430	0.7	421	0	428	0.7
APR	273	1.46	386	0.52	513	0.97	320	1.88	452	0.66	401	0.5	500	1	559	0.89
MAY	432	0	352	0.28	380	1.32	389	0.51	408	0.49	497	0	639	0	630	0.48
JUN	339	0.3	391	1	627	0.5	553	3.4	450	0	490	0.4	468	0.2	438	0.5
JUL	264	1.51	439	1.82	538	0.74	574	1.05	413	0.48	409	0.24	464	0.65	515	0.19
AUG	290	1.72	502	1.19	409	1.22	606	0.66	436	0.46	442	0	415	0.96	581	0.17
SEP	268	0.74	644	0.46	471	1.49	457	0.88	438	0.91	451	1.99	396	0.25	458	0.44
OCT	238	1.21	491	1.43	463	1.73	461	4.55	375	0	424	0.94	402	0.75	532	3.19
NOV	380	1.84	338	2.07	235	1.28	508	0	349	0	421	0.48	420	0.48	538	3.72
DEC	167	0	253	4.35	401	4.24	519	2.31	323	0.62	352	2.27	324	0.31	325	0.62
TOTAL	4496	0.82	4947	1.23	5424	1.63	5591	1.64	5479	0.5	5062	0.79	5337	0.56	5795	0.99

MONTH	2008		2009		2010		2011		2012		2013		2014		2015	
	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %	Samples	BAD %
JAN	351	0	584	0.86	328	0.61	517	2.32	501	0.2	464	1.29	566	0.18	467	0.21
FEB	562	0.36	431	0.46	355	0.56	354	0	560	0.71	431	0.7	578	0.35	426	0.23
MAR	600	2.33	716	1.54	472	0.42	246	0.41	548	0.91	270	0.37	653	0.15	467	0
APR	617	0.81	349	1.72	591	1.52	481	0.62	496	1.41	358	1.96	673	1.19	449	0.22
MAY	551	0.54	247	2.83	513	0.58	483	0.41	529	0.57	405	0.99	522	0.57	583	0.51
JUN	374	1.9	382	0.52	444	0.45	471	0.64	472	0.21	503	0.8	492	0.41	356	0.56
JUL	398	1.76	340	1.18	431	0.46	477	0.42	412	0.24	385	1.82	277	1.44	393	0.51
AUG	486	1.44	340	2.94	342	1.2	289	0	333	0.3	317	0.32	403	1.99	559	0.18
SEP	369	1.35	361	6.65	348	1.72	267	0	509	0.39	461	0.87	593	2.36	384	0.26
OCT	388	1.29	316	0.63	436	0.92	290	1.38	309	0.65	497	2.01	381	4.2	449	0.45
NOV	461	1.3	257	0.78	275	0.73	321	0.31	327	0	451	0.89	610	0.33	521	1.34
DEC	384	0.26	296	2.03	299	0	351	0.85	385	0.52	683	2.93	547	0.37	568	1.23
TOTAL	5541	1.13	4619	1.85	4834	0.76	4547	0.61	5381	0.51	5225	1.25	6295	1.13	5622	0.48

Notes: (1) The samples are collected from the Water Distribution Network. (2) According to the WHO guidelines for drinking water, level of bad samples is 5% (i.e. up to 5% can be tolerated).



SDG GOAL 6: Targets Monitoring and Progress Achieved



Indicator 6.2.1 Proportion of population using safely managed sanitation services, including a handwashing facility with soap and water





SDG GOAL 6: Targets Monitoring and Progress Achieved



Indicator 6.3.1 Proportion of wastewater safely treated

Years	Total municipal water use	Total wastewater collected	Total wastewater treated	Total wastewater treated and reused	% of the collected wastewater to the total municipal water use	% of the treated wastewater to the collected wastewater	% of the reused wastewater to the treated wastewater
2000	124	58	58	16	47	100	28
2001	132	59	59	17	45	100	29
2002	135	60	60	18	44	100	30
2003	143	60	60	23	42	100	38
2004	150	62	62	23	41	100	37
2005	155	64	64	27	41	100	42
2006	163	64	64	30	39	100	47
2007	169	84	84	37	50	100	44
2008	187	92	92	43	49	100	47
2009	211	103	103	44	49	100	43
2010	227	115	115	45	51	100	39
2011	233	116	116	44	50	100	38
2012	235	115	115	42	49	100	37
2013	244	123	123	38	50	100	31
2014	254	148	148	38	58	100	26
2015	252	145	145	35	58	100	24

All in million cubic meters unless otherwise stated.

Notes:

1. Total municipal water use does not include piped water used for productive agriculture.
2. Total reused water represents tertiary treated water reused for irrigation.
3. The differences between the percentage of treated wastewater to the collected wastewater and the reused wastewater to the treated wastewater (Column 7 and 8) represent the amount of secondary or primary treated wastewater disposed of to the sea.
4. The figures for the wastewater collected for the years 2001 and 2002 are estimates.



SDG GOAL 6: Targets Monitoring and Progress Achieved

Indicator 6.3.1 Proportion of wastewater safely treated

Indicator 6.3.2 Proportion of water with good ambient quality

Parameter	Maximum Allowable Limit	Major effluent criteria versus the average secondary effluent quality from Tubli WPC 2003 - 2013										
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PH (PH unit)	6-9	--	--	--	7.3	7.4	7.5	7.4	7.5	7.4	7.5	7.6
Total Dissolved solids	3,500	3,405	3,641	3,797	2,900	3,300	3,436	2,600	2,400	2,200	1,940	2,112
Turbidity (NTU)	2	--	--	--	5.1	3.8	6.7	3.2	2.2	1.3	1.7	2.3
Ammonia as NH ₃	3	1.5	1.2	0.2	7.2	5.5	7.0	12.1	16.8	8.8	7.0	11.8
Nitrate as NO ₃	20	1.9	1.7	3.7	0.8	1.0	1.0	0.5	2.3	2.4	1.9	2.3
BOD	10	1.7	1.0	0.7	7.8	4.8	5.1	3.7	6.9	6.8	6.8	7.9
COD	40	--	--	--	32	20.3	30	22	26	23	27	30
TSS	10	8.3	11.8	10.8	17	16	12	13.4	14.4	11.7	11.6	13.3
Phosphorus	15	3.4	2.8	1.9	--	--	--	--	--	--	--	--
Fecal Coliform (count/100ml)	2.2	10.3	2.2	0	--	--	--	--	--	--	--	--

All parameters are in mg/l unless otherwise stated.

(--) Indicates data not available.



SDG GOAL 6: Targets Monitoring and Progress Achieved

Indicator 6.4.1 Change in water use efficiency over time (agriculture sector)





SDG GOAL 6: Targets Monitoring and Progress Achieved

Method of Computation

Change in agricultural water use efficiency over time is calculated as the **agricultural value added** per net water withdrawn for agriculture using the formula:

$$A_{we} = \frac{GVA_a \times (1 - C_r)}{V_a - R_a}$$

Where:

A_{we}	Irrigated agriculture water efficiency [US\$/m ³]
GVA_a	Gross value added by agriculture (excluding river and marine fisheries and forestry) [US\$] ¹
C_r	Proportion of agricultural GVA produced by rainfed agriculture [US\$/m ³] ²
V_a	Volume of water withdrawn by the agriculture sector, including irrigation and livestock [m ³]
R_a	Volume of water returned to the hydrologic system (return flow) [m ³]

Notes:

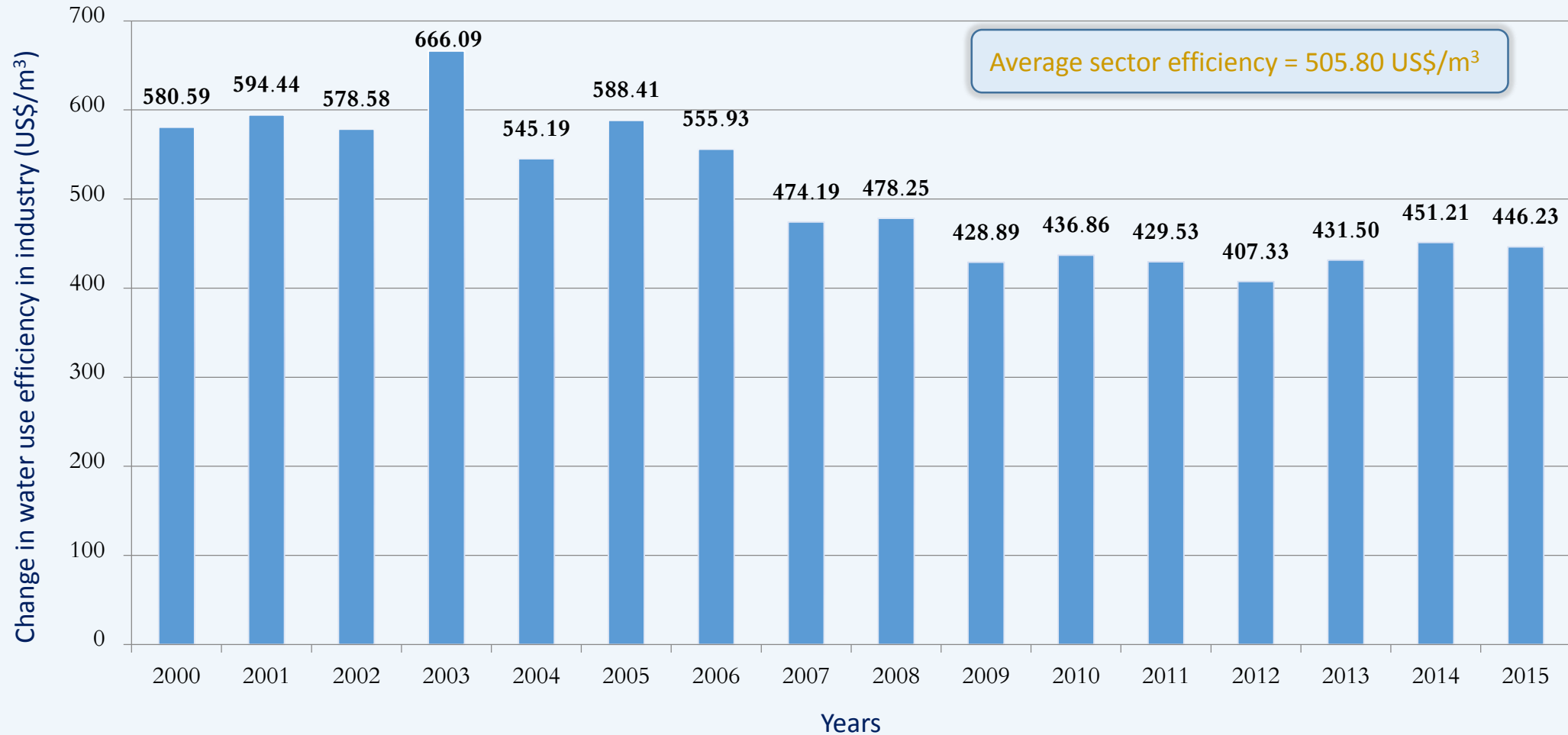
1- At constant prices.

2- C_r is assumed to vary depending on the average rainfall in the respective year.



SDG GOAL 6: Targets Monitoring and Progress Achieved

Indicator 6.4.1 Change in water use efficiency over time (industrial sector)





SDG GOAL 6: Targets Monitoring and Progress Achieved



Method of Computation

Change in industrial water use efficiency over time is calculated as the industrial value added per net water withdrawn for industry using the formula:

$$I_{we} = \frac{GVA_i}{V_i - R_i}$$

Where:

I_{we} Industrial water efficiency [US\$/m³]

GVA_i Gross value added by industry (including energy) [US\$]¹

V_i Volume of water withdrawn by the industrial sector (including energy) [m³]

R_i Volume of water returned to the hydrologic system (return flow) [m³]²

Notes:

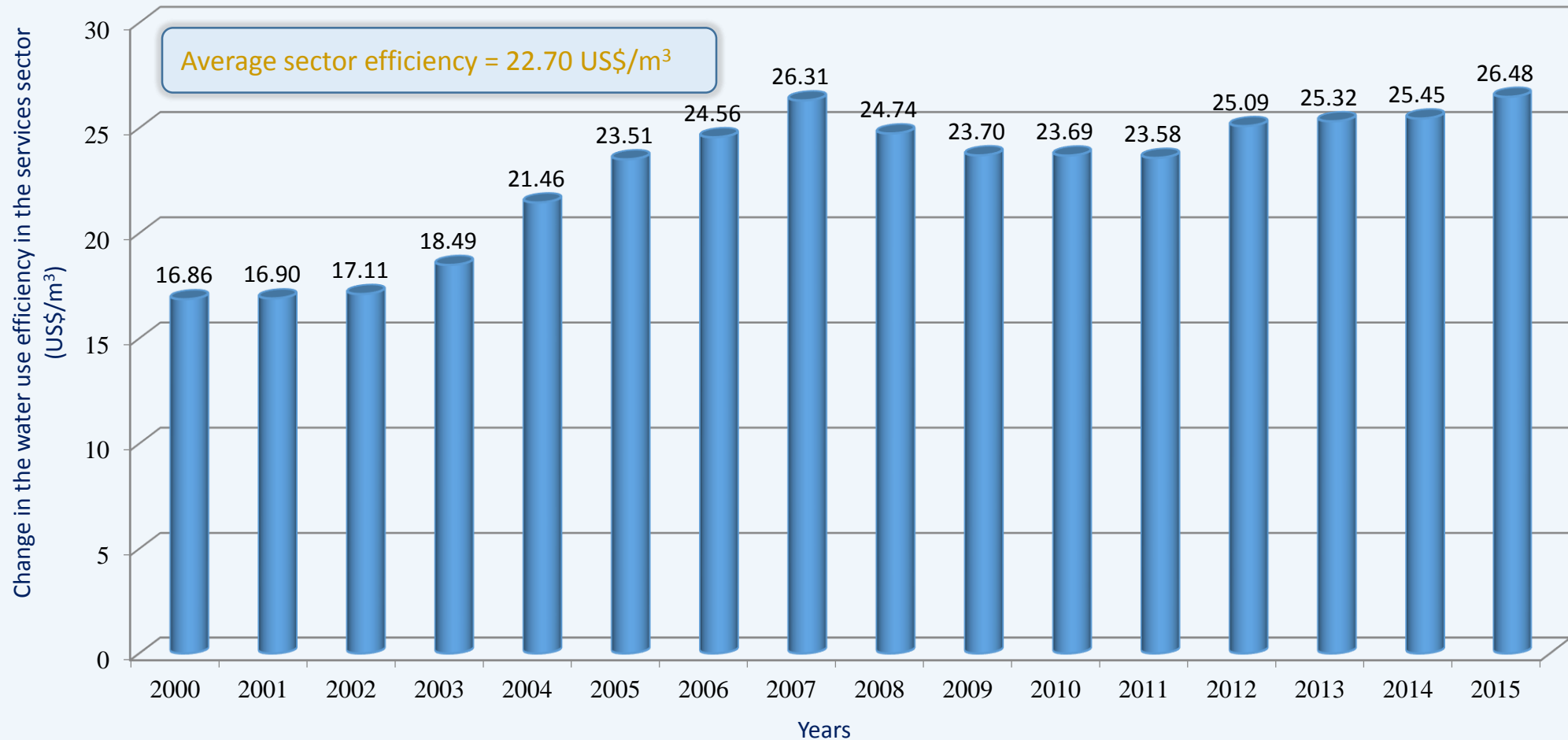
(1) At constant prices.

(2) Taken at 15% of V_i .



SDG GOAL 6: Targets Monitoring and Progress Achieved

Indicator 6.4.1 Change in water use efficiency over time (services sector)





SDG GOAL 6: Targets Monitoring and Progress Achieved



Method of Computation

Change in services water supply efficiency over time is calculated as the **service sector value added** divided by water withdrawn for distribution by the water supply industry, expressed in USD\$/m³, using the formula:

$$S_{we} = \frac{GVA_s}{V_s}$$

Where:

S_{we} Service water use efficiency [US\$/m³]

GVA_s Gross value added by services [US\$]*

V_s Volume of water withdrawn by the service sector [m³]

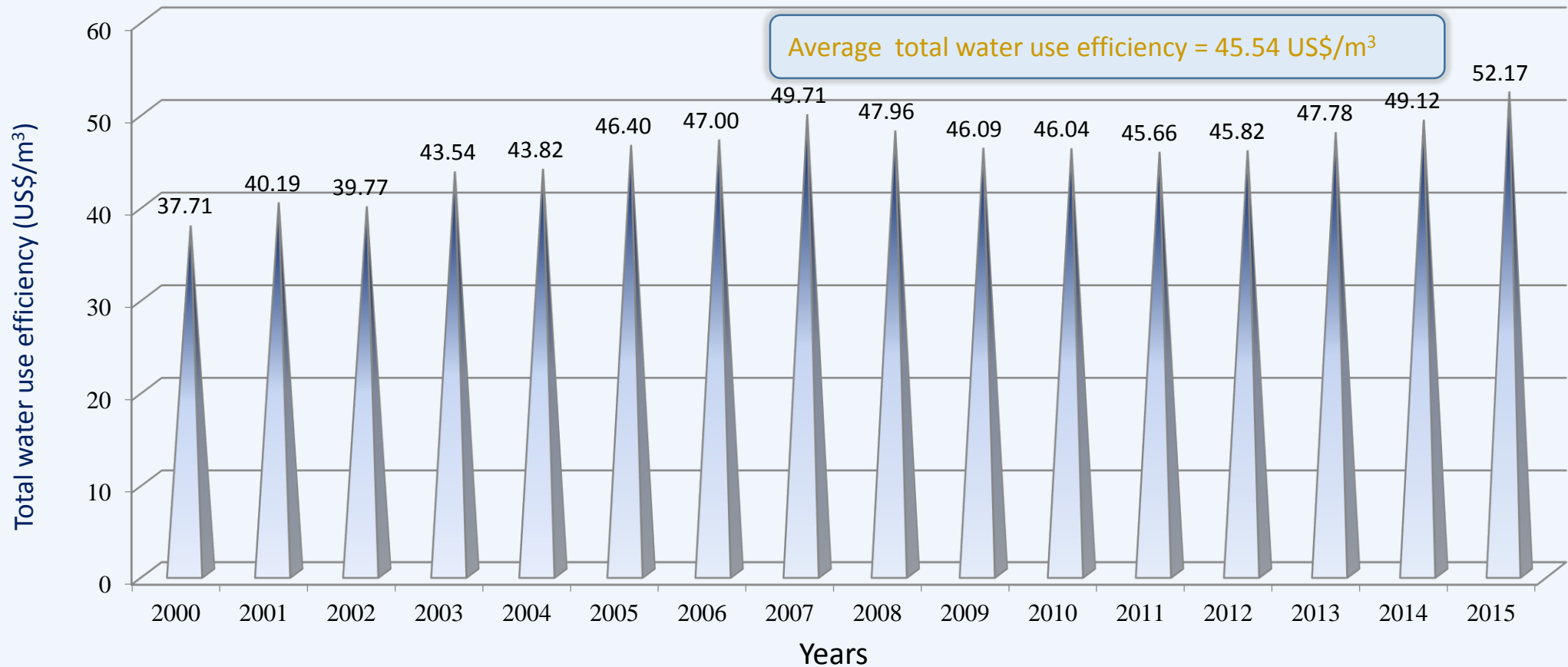
Note:

() At constant prices.*



SDG GOAL 6: Targets Monitoring and Progress Achieved

Indicator 6.4.1 Change in water use efficiency over time (Total water use efficiency)





SDG GOAL 6: Targets Monitoring and Progress Achieved

Method of Computation

Total water use efficiency is computed as the sum of the three major water use sectors, **weighted according to the proportion of water withdrawn** by each sector over the total withdrawals. The formula is as follows:

$$WUE = A_{we} \times P_A + I_{we} \times P_i + S_{we} \times P_s$$

Where:

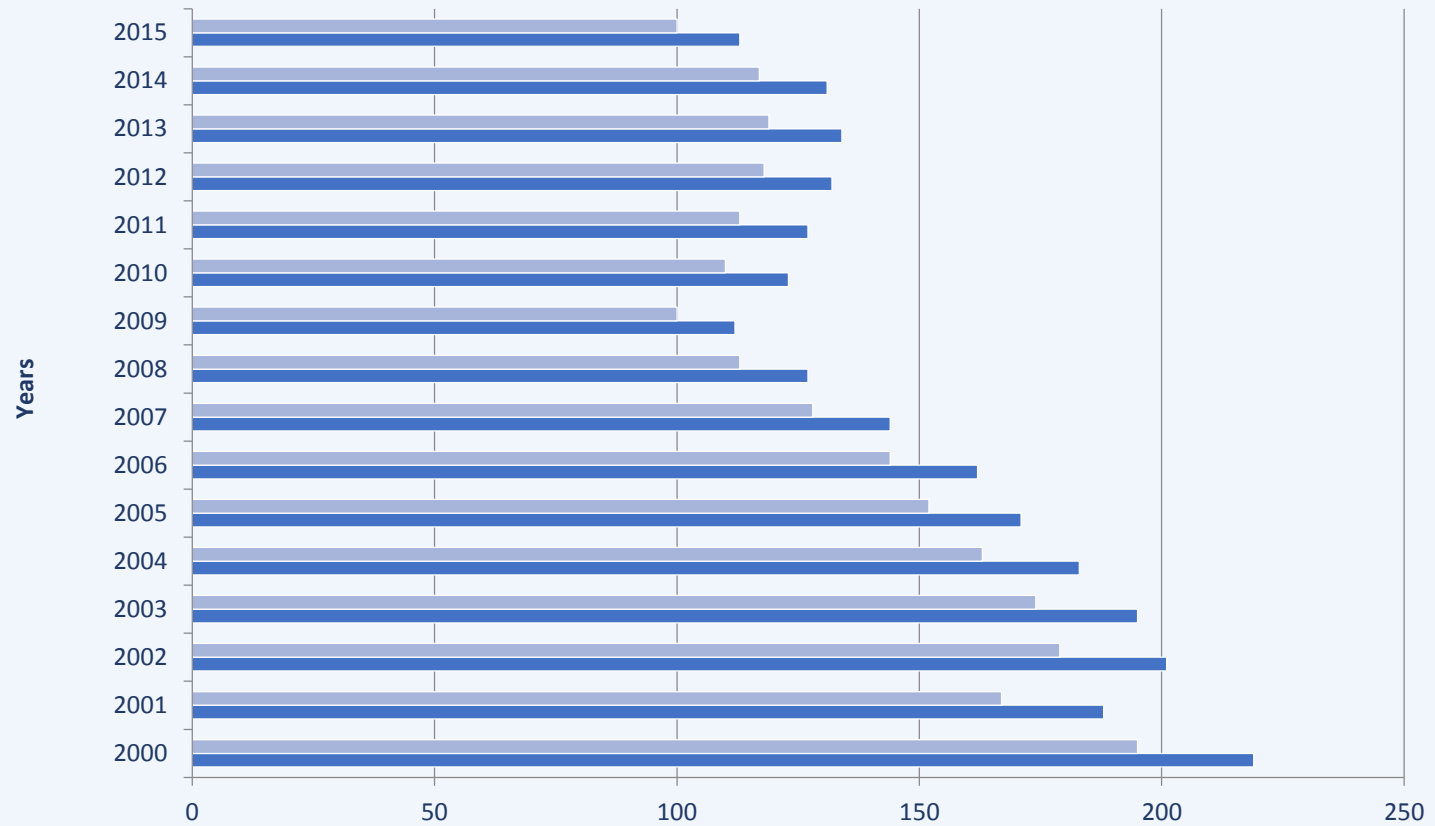
- WUE Water use efficiency
- A_{we} Irrigated agriculture water use efficiency [US\$/m³]
- I_{we} Industrial water use efficiency [US\$/m³]
- S_{we} Services water use efficiency [US\$/m³]
- P_A Proportion of water withdrawn by the agriculture sector over the total withdrawals
- P_i Proportion of water withdrawn by the industrial sector over the total withdrawals
- P_s Proportion of water withdrawn by the service sector over the total withdrawals



SDG GOAL 6: Targets Monitoring and Progress Achieved



Indicator 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available fresh water resources



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
■ Percentage of renewable groundwater withdrawn (%)	195	167	179	174	163	152	144	128	113	100	110	113	118	119	117	100
■ Total withdrawal of renewable freshwater (Mm3)	219	188	201	195	183	171	162	144	127	112	123	127	132	134	131	113



SDG GOAL 6: Targets Monitoring and Progress Achieved



Method of Computation

Level of water stress is computed as a **total freshwater withdrawn** (TWW) divided by the difference between the **total available renewable freshwater resources** (TRWR) and the environmental water requirements (Env.)* multiplied by 100. All expresses in Mm³/year.

$$\text{Level of water stress}(\%) = \frac{TWW}{TRWR - Env.} \times 100$$

**Environmental water requirements was not considered in our calculations.*



SDG GOAL 6: Targets Monitoring and Progress Achieved

Target 6.5/Indicator 6.5.1: Degree of integrated water resources management **implementation** (0 – 100).

- Progress not evaluated.
- UN-IWRM Questionnaire.
- Multi-institutional completion/Water Resources Council.

Target 6.5/ Indicator 6.5.2: Proportion of **transboundary basin** with an operational arrangement for water cooperation.

- The main aquifer system is of transboundary nature.
- No transboundary basin agreement achieved.
- UN-IWRM Questionnaire - Clauses 1.2.c and 2.2.e.



SDG GOAL 6: Targets Monitoring and Progress Achieved



Indicator 6.6.1 Change in the extent of water-related ecosystems over time (aquifer case)





SDG GOAL 6: Targets Monitoring and Progress Achieved

■ The Means of Implementation Targets and Additional Indicators

Target 6.a/Indicator 6.a.1: Amount of water-and sanitation-related **official development assistance** that is part of a government coordinated spending plan.

- Progress not evaluated.
- GCC Development Programme.

Target 6.b/Indicator 6.b.1: Proportion of local administrative units with established and operational policies and procedures for **participation of local communities** in water and sanitation management

- Perhaps not applicable to the Bahrain situation.
- The UN-IWRM Questionnaire.



Concluding Remarks



- The findings from this preliminary activity has presented a clear picture of the current situation in Bahrain regarding the progress towards the implementation of **SDG Goal 6 targets and indicators**, including **identification of data availability and gaps**, current obstacles, and challenges ahead.
- We found that some of the SDG Goal 6 targets and indicators are **irrelevant** (indicator 6.b.1 and indicator 6.a.1?) or only **partially relevant** (indicators 6.3.2 and 6.6.1) to the Bahrain situation.
- In 2015, more than **99 percent** of the population had **sustainable, affordable, and equitable** access to safe drinking water services. The remaining percentages represent the **bending applications**.
- The size of people with safely managed access to sanitation facilities has expanded from **73 percent in 2000 to 92 percent in 2015**. The rest of population (8 percent) are connected to **improved sanitation services**.
- The **treatment rate** has been completely achieved well beyond the targeted level. The secondary treated effluent disposed of to the water-related ecosystems appear to be **in line with the local and international standards**.
- The **rate of reuse** is, however, extremely low. Therefore, there is an urgent need to increase the amount of reuse of treated wastewater.



Concluding Remarks

- Obviously, there is a need to improve the quality of data regarding wastewater collection, treatment, and reuse by carrying out the recommended **households and establishments surveys**.
- On average, our analysis water use efficiency values of **0.43**, **505.80** and **22.70** US\$/m³, for the agriculture, industry and services sectors, respectively. The overall water use efficiency is averaging at **45.54** US\$/m³. This indicates extremely **inefficient water uses**, particularly in the **agriculture sector**. The positive sign, however, is that the efficiency in this sector has seen a rise from **0.30** US\$/m³ in 2000 to **0.62** US\$/m³ in 2015.
- Despite the significant progress made towards **alleviating the deficit** in the renewable resources water balance, this notable success appears to be associated with **very high cost**.
- The computed Tier III indicators figures presented in this work should, however, be **viewed as preliminary**; meaning that review might be required for the purpose of the next **SDG Goal 6 country reports**.
- The **UN-IWRM Questionnaire** is foreseen to provide valuable data and information for measuring indicator 6.5.1 (Integrated Water Resources Management), and possibly indicators 6.a.1 and 6.b.1.



Concluding Remarks



Summary of Data Status and Progress Achieved

SDG GOAL 6 Ensure availability and sustainable management of water and sanitation for all					
Targets	Indicators	Data Status			Progress
		Available	Partially available	Not available	
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services	√			Target completely achieved. Slightly less than 100% coverage indicates that some requests are under processing. Supply is continuous. Rural and urban categorisation is not applicable to Bahrain situation. Drinking water quality is up to the chemical and microbiological international standards.
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation , paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Proportion of population using safely managed sanitation services , including a handwashing facility with soap and water	√			Target completely achieved. All the population use safely managed sanitation facilities. In 2015, 92% directly connected to public sewers and the rest 8% use improved sanitation facilities (septic tanks). Hygiene and handwashing are not issues in Bahrain. Closely related to indicator 3.9.2 of SDG Goal 3. Discussed with the Ministry of Health.

[Continue ...](#)



Concluding Remarks



SDG GOAL 6 Ensure availability and sustainable management of water and sanitation for all

Targets	Indicators	Data Status			Progress
		Available	Partially available	Not available	
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 Proportion of wastewater safely treated		√		Completely achieved in terms of percentage of wastewater safely treated. Quality of secondary treated water disposed to the sea is also in line with the local and international quality standards. Reuse and recycling are not in advance stage. Carrying out of houses and establishment questionnaire survey is recommended. Rivers, lakes, and fresh water wetlands is not applicable to Bahrain situation. The case of shallow groundwater is applicable.
	6.3.2 Proportion of bodies of water with good ambient water quality			√	
6.4 By 2030, substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Changes in water use efficiency over time	√			Water use efficiency generally low, especially in the agriculture sector (average 0.43US\$/m ³). In industry and services are 505.80 and 22.70 US\$/m ³ , respectively. On average, overall water use efficiency is about 45.54 US\$/m ³ . No benchmarking data were available for comparison.

[Continue ...](#)



Concluding Remarks



SDG GOAL 6 Ensure availability and sustainable management of water and sanitation for all

Targets	Indicators	Data Status			Progress
		Available	Partially available	Not available	
	6.4.2 Level of water stress : freshwater withdrawal as a proportion of available freshwater resources	√			Levels of water stress over time computed. Good progress achieved, but at high cost. Withdrawal from the renewable aquifer almost reduced to the recharge rate in 2015.
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 Degree of integrated water resources management implementation (0 – 100)		√		Arranged with the Water Resources Council to complete the IWRM questionnaire. Results are to be incorporated in the next Goal 6 report. National Water Strategy is being implemented.
	6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation		√		Although the main groundwater aquifer is a transboundary aquifer, there is no operational arrangement for the shared management of this aquifer. More information may be obtained from the IWRM questionnaire ⁽¹⁾ .
6.6 By 2020, protect and restore water-related ecosystems , including mountains, forests, wetlands, rivers, aquifer and lakes	6.6.1 Change in the extent of water-related ecosystems over time	√			May be the quantitative equivalent of indicator 6.3.2. Applicable only for groundwater aquifers for which data exist ⁽²⁾ . Continue ...



Concluding Remarks



SDG GOAL 6 Ensure availability and sustainable management of water and sanitation for all

Targets	Indicators	Data Status			Progress
		Available	Partially available	Not available	
6.a By 2030, expand international cooperation and capacity-building support to developing countries in water-and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	6.a.1 Amount of water-and sanitation-related official development assistance that is part of a government coordinated spending plan			√	Part of the Gulf Cooperation Development Programme is devoted to the water and sanitation projects. No financial data were made available. Whether this indicator is applicable to the said programme is yet to be known.
6.b Support and strengthen the participation of local communities in improving water and sanitation management	6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management			√	Procedures and policies for participation of local communities in water and sanitation management do not exist in Bahrain. Clauses 2.2.b, 2.1.c, and 2.1.d of the IWRM questionnaire may clarify this point.

Notes:

(1) Additional information may be obtained from clauses 1.2.c and 2.2.e of the IWRM questionnaire.

(2) Additional information may be obtained from clauses 3.1.c and 3.1.d of the IWRM questionnaire.

Acknowledgment

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Thank You

