Supplementary materials

Table S1 The information on the studied municipal wastewater treatment plants from 12 provinces (data collected in 2018).

Province	City/county	Name of Treatment plant	Treatment process	Population covered $\times 10^3$	Treatment capacity (Million m^3/yr)	Starting year of operation	Operational lifetime* (year)	Total operation cost** ($\times 10^{-3}$ US\$/m^3)	Nitrogen removal
Ardabil	Ardabil	Ardabil	AL	120	8.40	2005	16	12.75	No
	Garmi	Garmi	AL	72	3.65	2001	20	7.78	No
	Khalkhal	Khalkhal	CAS	50	3.65	2004	17	7.24	No
	Meshkin Shahr	Meshkin Shahr	SP	112	3.65	2016	5	-	Yes
East Azerbaijan	Ahar	Ahar	CAS	87	7.04	2008	13	20.87	No
	Ajabshir	Ajabshir	CAS	27	1.69	2008	13	70.79	No
	Bostanabad	Bostanabad	SBR	12	1.15	2013	8	47.62	Yes
	Jolfa	Jolfa	CAS	3.99	0.85	2007	14	49.83	No
	Maragheh	Maragheh	SBR	154	15.62	2005	16	9.17	Yes
	Marand	Marand	CAS	60	5.89	2006	15	27.47	No
	Mianeh	Mianeh	CAS	75	6.31	2005	16	20.34	No
	Sarab	Sarab	CAS	41	2.63	2012	9	26.2	No
	Tabriz	Tabriz	CAS	1026	53.47	2001	20	6.91	No
Fars	Sadra	Sadra	AL	70	3.65	2006	15	28.7	No
	Shiraz	Shiraz	CAS	440	25.55	2006	15	13.98	No
Hormozgan	Bandar-e Abbas	Bandar-e Abbas	CAS	320	7.78	2004	17	75.83	No
Isfahan	Anarak	Anarak	AL	1.57	0.10	1984	37	-	No
	Ardestan	Ardestan	SP	6.41	0.27	2008	13	-	Yes
	Bagh-e Bahadoran	Bagh-e Bahadoran	AL	5.07	0.29	2006	15	-	No
	Baharestan	Baharestan	CAS	66	4.39	2010	11	52.23	No
	Buin-Miandasht	Buin-Miandasht	AL	7.93	0.29	2008	13	201.03	No
	Daran	Daran	AL	7.16	0.23	2015	6	219.82	No
	Foolad Shahr	Foolad Shahr	SP	72	4.37	1972	49	18.55	Yes
	Ghahderijan	Ghahderijan	SP	4.09	0.27	1997	24	-	Yes
	Harand	Harand	AL	3.28	0.10	2014	7	223.7	No
	Isfahan	East Isfahan	CAS	220	17.42	2016	5	-	No
		North Isfahan	AL	996	65.44	2016	5	14.01	No
		South Isfahan	CAS	736	43.34	2016	5	19.34	No
	Koohpayeh	Koohpayeh	AL	4.58	0.41	1988	33	-	No
	Mobarakeh	Mobarakeh	CAS	36	1.09	2004	17	59.54	No
		Safiyeh Mobarakeh	AL	13	0.67	1988	33	89.11	No
	Naein	Naein	SP	23	1.09	2005	16	20.69	Yes
	Semirom	Semirom	CAS	17	0.79	2005	16	22.32	No
	Sepahan Shahr	Sepahan Shahr	AL	62	4.90	2006	15	24.63	No
	Shahin Shahr	Shahin Shahr	SP	401	20.30	2016	5	-	Yes
	Shahreza	Shahreza	AL	51	2.69	1995	26	-	No
	Varzaneh	Varzaneh	SP	12	0.94	2008	13	-	Yes
	Zarinshahr	Zarinshahr	CAS	64	3.24	2008	13	74.12	No

Kermanshah	Bistoon	Bistoon	CAS	1.3	0.14	1998	23	83.84	No
	Eslamabad	Eslamabad	SP	147	4.93	2005	16	6.37	Yes
	Gilan Gharb	Gilan Gharb	SP	19	1.24	2005	16	6.86	Yes
	Kermanshah	Kermanshah	CAS	324	21.90	2004	17	6.44	No
	Paveh	Paveh	CAS	11	1.72	2005	16	12.24	No
	Qasr-e Shirin	Qasr-e Shirin	CW	19	0.80	2009	12	25.89	Yes
	Sarpol Zahab	Sarpol Zahab	CAS	32	2.63	2008	13	14.3	No
Kurdistan	Marivan	Marivan	EA	105	7.30	2013	8	18.15	No
	Qorveh	Qorveh	SP	60	5.84	2006	15	4.99	Yes
	Sanandaj	Sanandaj	CAS	465	36.27	2011	10	10.61	No
	Saqqez	Saqqez	A_2O	240	12.41	2012	9	12.42	Yes
	Serishabad	Serishabad	CAS	10	0.73	2016	5	-	Yes
Markazi	Arak	Arak 1	CAS	349	16.64	2012	9	11.51	No
		Arak 2	SP	188	8.96	2003	18	-	Yes
	Delijan	Delijan	SP	46	2.16	2003	18	18.34	Yes
	Khomein	Khomein	SP	59	2.52	2005	16	17.47	Yes
	Mahajeran	Mahajeran 1	CAS	22	0.64	2011	10	-	No
		Mahajeran 2	SP	9.6	0.28	2012	9	-	Yes
	Mahallat	Mahallat	EA	47	1.05	2005	16	45.62	No
	Saveh	Saveh	EA	63	3.15	2015	6	-	No
	Tafresh	Tafresh	EA	27	1.26	2016	5	-	No
Qom	Qom	Qom 1	CAS	110	6.83	1995	26	20.21	No
		Qom 2	CAS	250	18.25	1999	22	-	No
		Qom 3	CAS	250	18.91	2015	6	22.41	No
Razavi Khorasan	Mashhad	Olang	SP	125	9.13	2002	19	-	Yes
		Parkandabad 1	AL	83	5.55	2000	21	21.86	No
		Parkandabad 2	SP	333	21.90	2006	15	3.55	Yes
Tehran	Tehran	South Tehran	CAS	3150	246.38	2010	11	59.25	Yes
Yazd	Ardakan	Ardakan	A_2O	55	3.98	2017	4	-	Yes
	Yazd	Yazd	SBR	213	15.55	2012	9	19.21	Yes

CAS: conventional activated sludge, EA: extended aeration, A_2O: anaerobic-anoxic-aerobic, SBR: sequencing batch reactor, AL: aerated lagoon, CW: constructed wetland.

* Operational lifetime calculated up to 2021

** Total operation cost is sum of the personnel, chemicals, maintenance, and energy costs