

Presence of benzodiazepines in aquatic environments: a systematic review of the literature

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Supplementary Table 2. Characteristics of the studies included in the systematic review.

Author, year of publication	Geographic area	Sampling period	Analyzed sample	Benzodiazepines identified in the study sample	Benzodiazepines concentration (ng/L) in the study sample
Van Der Ven et al., 2004 [1]	Belgium	March 2001 August 2001	STPs influent STPs effluent	Diazepam	<i>Min-max range</i> STP influent: <LOQ-1180 STP effluent: <LOQ-660
Hummel et al., 2006 [2]	Rhineland-Palatinate region Saarland region Hesse region (Germany)	March 2005 November 2005	STPs influent STPs effluent Surface water from rivers and streams	Oxazepam Temazepam	<i>Median</i> Oxazepam STP influent: 480 STP effluent: 320 Surface water: 90 Temazepam STP influent: 55 STP effluent: 50 Surface water: 23
Rabiet et al., 2006 [3]	Hérault River basin (France)	April 2004	Drinking water wells WWTP effluents Surface water from rivers	Nordiazepam	<i>Min-max range</i> WWTP effluents: <LOQ-8 Surface water: <LOQ-2.4
Vanderford and Snyder, 2006 [4]	Nevada (United States)	March 21 st -29 th , 2006	WWTP influent WWTP effluent Surface water from an urban waterway Boulder basin of a lake Finished drinking water	Diazepam	<i>Mean (±RSD)</i> WWTP effluent: 3.7 (±4.6) Surface water: 2.6 (±2.5)
Wert et al., 2009 [5]	Nevada Colorado Florida (United States)	-	WWTPs effluents	Diazepam	<i>Min-max range</i> 2.6 - 7.4
Bisceglia et al., 2010 [6]	Baltimore (United States)	January 19 th , 2008	WWTP influent WWTP effluent	Diazepam	<i>Mean (±SD)</i> WWTP influent: 40 (±2) WWTP effluent: 40 (±3)
González Alonso et al., 2010 [7]	Madrid (Spain)	March 28 th , 2007 May 25 th , 2007	Surface water downstream of STP	Nordiazepam Oxazepam 7-aminoflunitrazepam	<i>Median (min-max range)</i> Nordiazepam : 26 (19-76) Oxazepam : 30 (6-129) 7-aminoflunitrazepam : 55 (<LOD-55)
Gracia-Lor et al., 2010 [8]	Benicàssim Burriana Castellón de la Plana (Spain)	June 2008 January 2009	WWTP influent WWTP effluent	Lorazepam	<i>Maximum detected level</i> WWTP effluent: 60
Madureira et al., 2010 [9]	Douro River estuary (Portugal)	From October 2007 to July 2008	Surface water from Douro River estuary	Diazepam	<i>Min-max range</i> <LOQ - 3.65
Magnér et al., 2010 [10]	Stockholm (Sweden)	-	Surface water	Oxazepam	<i>Min-max range of mean values (±RSD)</i> 4.8 (±27.1) - 12.7 (±3.9)
Baker and Kasprzyk-Hordern, 2011 [11]	England (United Kingdom)	From December 2009 to November 2010	WWTPs influent WWTPs effluent River water	Temazepam Diazepam Nordiazepam Oxazepam	<i>Mean (max)</i> Temazepam WWTP influent: 167.0 (278.3) WWTP effluent: 135.3 (251.1) River water: 27.8 (52.9) Diazepam WWTP effluent: 5.1 (6.2) River water: 0.8 (1.1) Nordiazepam WWTP influent: 25.2 (51.5) WWTP effluent: 9.9 (14.2) River water: 3.2 (5.5) Oxazepam WWTP influent: 49.5 (113.8) WWTP effluent: 57.9 (82.8) River water: 11.4 (17.4)
Hass et al., 2011 [12]	Berlin (Germany)	From April to June 2010	Groundwater samples WWTP influent WWTP effluent	Oxazepam	<i>Mean (min-max range)</i> WWTP influent: 130 (<LOQ – 180) WWTP effluent: 110 (<LOQ – 180)
Sousa et al., 2011 [13]	Porto Douro River basin (Portugal)	Once every 3 months in 2009	WWTPs influent WWTPs effluents Surface water from Douro River	Lorazepam	<i>Min-max range</i> WWTP effluents: 240-438
Bijlsma et al., 2012 [14]	Utrecht Eindhoven Apeldoorn Amsterdam (The Netherlands)	February 2010	STPs influents STPs effluents	Oxazepam Temazepam Nordiazepam	<i>Mean (min-max range)</i> Oxazepam <u>Utrecht</u> STP influent: 677 (231-915) STP effluent: 852 (445-994) <u>Eindhoven</u> STP influent: 377 (177-494) STP effluent: 486 (237-586) <u>Apeldoorn</u> STP influent: 589 (301-882) STP effluent: 778 (439-908) <u>Amsterdam</u>

					STP influent: 356 (210-430) STP effluent: 416 (312-476) <u>Schiphol</u> STP influent: 153 (109-245) STP effluent: 353 (339-367) Temazepam <u>Utrecht</u> STP influent: 297 (99-414) STP effluent: 406 (208-508) <u>Eindhoven</u> STP influent: 208 (92-279) STP effluent: 271 (133-314) <u>Apeldoorn</u> STP influent: 250 (209-300) STP effluent: 309 (159-371) <u>Amsterdam</u> STP influent: 208 (139-245) STP effluent: 233 (174-273) <u>Schiphol</u> STP influent: 164 (121-255) STP effluent: 309 (290-330) Nordiazepam <u>Utrecht</u> STP influent: 9.6 (4.2-21) STP effluent: 9.5 (7.1-11) <u>Eindhoven</u> STP influent: 4.7 (4.0-7.1) STP effluent: 7.1 (3.6-8.0) <u>Apeldoorn</u> STP effluent: 7.8 (4.7-9.7) <u>Amsterdam</u> STP effluent: 6.1 (4.5-7.5) <u>Schiphol</u> STP effluent: 8.3 (7.4-8.8)
Esteban et al., 2012 [15]	A Coruña Ourense Pontevedra Santiago de Compostela Vigo (Spain)	August 2008 January 2009 June 2009	STPs influent STPs effluent Downstream of STPs Tap water samples	α-Alprazolam Alprazolam Lorazepam Nordiazepam Oxazepam Tetrazepam	<i>Mean</i> α-Alprazolam STP influent: 20 Alprazolam STP influent: 27 STP effluent: 17 Downstream of STP: 17 Tap water: 11 Lorazepam STP influent: 10598 STP effluent: 689 Downstream of STP: 167 Tap water: 562 Nordiazepam STP influent: 16 STP effluent: 17 Oxazepam STP influent: 83 STP effluent: 84 Tetrazepam STP influent: 92 STP effluent: 64
Hass et al., 2012 [16]	Berlin (Germany)	May 2010 From March 2011 to January 2012	WWTP effluents Surface waters Bank filtration site on the shore of Lake Tegel Groundwater Drinking water treatment plants	Oxazepam	<i>Min-max range</i> WWTP effluents: 80-160 Surface waters: 30-40
Jurado et al., 2012 [17]	Barcelona (Spain)	May 2010 December 2010	Groundwater Surface water from the Besòs River	Alprazolam Diazepam Lorazepam	<i>Mean ($\pm$SD)</i> Alprazolam Groundwater: 0.8 ($\pm$2.1) Diazepam Groundwater: 5.9 ($\pm$7.9) Lorazepam Groundwater: 3.1 ($\pm$9.1)
López-Serna et al., 2012 [18]	Ebro River basin (Spain)	From September to October 2010	Surface water from the Ebro River	Desmethyl diazepam Lorazepam Oxazepam glucuronide	<i>Min-max range</i> Desmethyl diazepam: <LOD-3.99 Lorazepam: <LOD-50.2 Oxazepam glucuronide: <LOD-70.8
Neng and Nogueira, 2012 [19]	Lisbon Beirolos Tagus River Costa da Caparica (Portugal)	-	Tap water Groundwater Surface water from an estuary and sea water WWTP effluent	Diazepam	<i>Mean ($\pm$SD)</i> WWTP effluent: 63.9 ($\pm$13.7)
Valcárcel et al., 2012 [20]	Tagus River basin (Spain)	June 28 th , 2010	Surface water from the Tagus River Downstream of STPs Tap water samples	Diazepam Lorazepam	<i>Median (min-max range)</i> Diazepam Surface water: 15.10 (3.96-40.90) Lorazepam

					Surface water: 29.00 (10.30-39.80)
Baker and Kasprzyk-Hordern, 2013 [21]	United Kingdom	From December 2009 to November 2010	WWTP influents WWTP effluents Surface water	7-aminonitrazepam Chlordiazepoxide Diazepam Nordiazepam Oxazepam Temazepam	<i>Median (min-max range)</i> 7-aminonitrazepam WWTP influent: 205.0 (21.6-440.6) Chlordiazepoxide WWTP effluent: 1.3 (1.3-1.3) Diazepam WWTP influent: 7.6 (6.6-8.0) WWTP effluent: 1.6 (0.5-7.1) Surface water: (0.5-1.1) Nordiazepam WWTP influent: 15.7 (5.0-63.9) WWTP effluent: 5.8 (0.8-16.0) Surface water: (0.1-6.8) Oxazepam WWTP influent: 22.0 (6.2-155.1) WWTP effluent: 32.9 (4.9-85.3) Surface water: (0.9-20.6) Temazepam WWTP influent: 84.9 (16.8-254.7) WWTP effluent: 78.6 (16.9-249.5) Surface water: (1.1-77.8)
De Almeida et al., 2013 [22]	Rio Grande do Sul (Brazil)	From August to September 2011	Hospital WWTP effluent	Bromazepam Clonazepam Diazepam Lorazepam	<i>Mean (±SD)</i> Bromazepam WWTP emergency effluent: 195 (±6) WWTP general effluent: 137 (±7) Clonazepam WWTP emergency effluent: 134 (±10) WWTP general effluent: 57 (±5) Diazepam WWTP emergency effluent: 645 (±1) WWTP general effluent: 571 (±10) Lorazepam WWTP emergency effluent: 96 (±7) WWTP general effluent: 42 (±4)
Loos et al., 2013 [23]	Austria Belgium Czech Republic Cyprus Finland France Germany Greece Hungary Ireland Italy Lithuania Netherlands Portugal Slovenia Spain Sweden Switzerland	2010	WWTPs effluents	Alprazolam Clonazepam Oxazepam	<i>Mean (min-max)</i> Alprazolam : 1.3 (<LOQ-33.0) Clonazepam : 1.6 (<LOQ-43.7) Oxazepam : 162 (<LOQ-1766)
Van Der Aa et al., 2013 [24]	Utrecht Apeldoorn Amsterdam Eindhoven (The Netherlands)	From October 4 th to November 1 st , 2009	STP influents STP effluents Surface water Raw drinking-/process water	Diazepam Nordiazepam Oxazepam Temazepam	<i>Mean (±SD)</i> Diazepam STP effluent: 4 (±1) Nordiazepam STP effluent: 19 (±7) Oxazepam STP influent: 1167 (±445) STP effluent: 1122 (±375) Surface water: 29 (±22) Raw drinking-/process water: 8 (±5) Temazepam STP influent: 427 (±179) STP effluent: 568 (±198) Surface water: 12 (±12) Raw drinking-/process water: 4 (±4)
Yuan et al., 2013 [25]	Beijing (China)	From August to September 2011	Psychiatric hospital's WWTPs influents Psychiatric hospital's WWTPs primary effluents Psychiatric hospital's WWTPs secondary effluents	Alprazolam Lorazepam Oxazepam	<i>Mean (±SD)</i> Alprazolam WWTP influent: 30 (±1) WWTP primary effluent: 32 (±0.2) WWTP secondary Effluent: 29 (±2) Lorazepam WWTP influent: 294 (±40) WWTP primary effluent: 353 (±22) WWTP secondary effluent: 205 (±22) Oxazepam WWTP influent 1: 942 (±155), WWTP influent 2: 286 (±42)

					WWTP secondary effluent 1: 751.7 (±34), WWTP primary effluent: 297 (±10) WWTP secondary effluent 2: 186 (±14)
Golovko et al., 2014 [26]	České Budějovice (Czech Republic)	From March 2011 to February 2012	WWTP influents WWTP effluents	Oxazepam	<i>Median (min-max range)</i> WWTP influent: 56 (24-77) WWTP effluent: 62 (26-94)
Lee et al., 2014 [27]	Baden (Switzerland)	-	Hospital WWTP effluent	Oxazepam	<i>Mean (±SE)</i> 251 (±5)
Mendoza et al., 2014 [28] [29]	Jarama and Manzanares Rivers (Spain)	February 19 th , 2012 March 15 th , 2012 July 15 th and 19 th , 2012	Surface water from Jarama and Manzanares River downstream of STPs	Alprazolam Diazepam Lorazepam	<i>Min-max range</i> Alprazolam: 2.9-9.1 Diazepam: 3.3-55.7 Lorazepam: 34.1-167.0
Moreno-González et al., 2014 [30]	Campo de Cartagena (Spain)	From 2009 to 2011	River water	Alprazolam Diazepam Lorazepam	<i>Min-max range:</i> Alprazolam <LOD-7.4 Diazepam: <LOD-5 Lorazepam: <LOD-117.1
Racamonge et al., 2014 [31]	Spain	-	WWTP influents WWTP effluents Surface water	Oxazepam Lorazepam Alprazolam Temazepam Lormetazepam Nordiazepam Diazepam	<i>Range of mean values (RSD<22% in all samples)</i> Oxazepam WWTP influent: 22-82 WWTP effluent: 52-70 Lorazepam WWTP influent: 13-61 WWTP effluent: 36-40 Alprazolam WWTP influent: 3.3-8.8 WWTP effluent: 7.0-8.0 Temazepam WWTP influent: 5.8-24 WWTP effluent: 12-15 Lormetazepam Influent: 10-108 Effluent: 7.7-25 Nordiazepam WWTP influent: 5.0-18 WWTP effluent: 9.6-9.9 Diazepam WWTP influent: <LOQ-7.9 WWTP effluent: 2.2-5.4
Arbeláez et al., 2015 [32]	Catalonia (Spain)	From February to July 2013	River water from Llobregat, Ter and Ebro Rivers STP influent STP effluent	Bromazepam Diazepam Nordiazepam	<i>Min-max range (n=3, RSD<12%)</i> Bromazepam STP influent: 57.0–94.2 STP effluent: 12.2–37.8 Diazepam STP influent: 36.6–69.3 STP effluent: 28.2–63.6 Nordiazepam Ebro River: 1.0–1.1 STP influent: 30.1–56.2 STP effluent: 5.0–17.7
Butkovskiy et al., 2015 [33]	Noorderhoek (The Netherlands)	From March 5 th to May 30 th , 2013 From August 26 th to October 2 nd , 2014	Black water treatment system effluent	Oxazepam	<i>Range of mean values (±SD)</i> 3000 (±500) - 3200 (±700)
Camilleri et al., 2015 [34]	Lyon at Bourgoin-Jallieu (France)	October 2011	Surface water from Bourbre river and Bion river	Lorazepam Oxazepam	<i>Range of mean values (±RSD)</i> Lorazepam: 1.6 (±0.18) – 37.3 (±3.87) Oxazepam: 9.1 (±0.75) – 307.0 (±3.09)
De Almeida et al., 2015 [35]	Rio Grande do Sul (Brazil)	October 08 th -14 th , 2013	Hospital emergency effluent Hospital general effluent Hospital watercourse receptor	Diazepam	<i>Mean (±SD)</i> Hospital emergency effluent: 550.0 (±4.3) Hospital general effluent: 441.0 (±7.9) Hospital watercourse receptor: 586.6 (±9.3)
Klaminder et al., 2015 [36]	Uppsala (Sweden)	2013	Upstream Uppsala WWTP Downstream Uppsala WWTP Surface water from Fyris River (Fyrisbridge and Flottsundsbridge) Surface water from Lake Ekoln	Oxazepam	Upstream Uppsala WWTP: 9 Downstream Uppsala WWTP: 210 Fyrisbridge: 42 Flottsundsbridge: 100 Lake Ekoln Uppsala: 26
Mackuľak et al., 2015a [37]	Bratislava (Slovakia)	October 23 rd , 2013	WWTP influent WWTP mechanical step WWTP biological step WWTP sludge water WWTP effluent	Oxazepam	<i>Mean (±SD)</i> WWTP influent: 129 (±12) WWTP mechanical step: 66 (±5) WWTP biological step: 67 (±7) WWTP sludge water: 71 (±6) WWTP effluent: 83 (±7)
Mackuľak et al., 2015b [38]	Bratislava (Slovakia)	February 19 th , 2013 March 10 th , 2013 July 9 th , 2013	WWTP influent WWTP effluent	Oxazepam	<i>Range of mean values (±SD)</i> WWTP influent: 106 (±8)-280 (±30) WWTP effluent: 86 (±8)-240 (±20)

		July 16 th , 2013			
Miller et al., 2015 [39]	London (United Kingdom)	September 2012	Surface water from eight tributaries of the River Thames	Diazepam Temazepam	<i>Min-max range</i> Diazepam: ND-4 Temazepam: ND-67
Moreno-González et al., 2015 [40]	Mar Menor lagoon (Spain)	April 28 th - 29 th , 2010 July 26 th - 27 th , 2010 October 14 th - 15 th , 2010 February 24 th - 25 th , 2011	Sea water	Lorazepam	<i>Mean (±SD)</i> Spring 2010: 30.8 (±8.7) Summer 2010: 3.2 (±9) Winter 2011: 27.4 (±13.5)
Racamonde et al., 2015 [41]	Santiago de Compostela (Spain)	October 2013 March 2014	WWTP influent WWTP effluent Surface water from Sar River	Lorazepam Lormetazepam Nordiazepam Oxazepam Prazepam Temazepam	<i>Range of mean values (±RSD)</i> Lorazepam WWTP influent: 10 (±14) – 67 (1) WWTP effluent: 68 (±1) - 103 (±6) Lormetazepam WWTP influent: 4 (±10) – 29 (±12) WWTP eEffluent: 21 (±3) – 42 (±11) Nordiazepam WWTP influent: 6 (±10) – 26 (±13) WWTP effluent: 15 (±9) – 25 (±11) Oxazepam WWTP influent: 9 (±14) – 79 (±11) WWTP effluent: 70 (±8) – 152 (±19) Prazepam WWTP effluent: 4 (±20) – 7 (±9) Temazepam WWTP influent: 10 (±11) – 18 (±14) WWTP effluent: 15 (±8) – 36 (±15)
Radović et al., 2015 [42]	Danube River Basin (Serbia)	April 2012	Surface water from Danube River Groundwater from wells near Danube River	Lorazepam	<i>Min-max range</i> Surface water: <LOD–37
Subedi and Kannan, 2015 [43]	New York (United States)	July 12 th – 18 th , 2013	WWTPs influent WWTPs primary effluent WWTPs final effluent	Lorazepam Alprazolam α -hydroxylalprazolam, Diazepam Oxazepam Nordiazepam	<i>Min-max range</i> Lorazepam WWTPs influent: 6.11–34.3 WWTPs primary effluent: 3.01–28.7 WWTPs effluent: 3.10–85.5 Alprazolam WWTPs influent: 3.09–12.6 WWTPs primary effluent: ND-8.84 WWTPs effluent: 3.10-8.21 α-hydroxylalprazolam WWTPs influent: 5.86–28.5 WWTPs primary effluent: ND-28.2 WWTPs effluent: ND-46.6 Diazepam WWTPs influent: 2.29–9.78 WWTPs primary effluent: <LOQ-8.21 WWTPs effluent: <LOQ-4.00 Oxazepam WWTPs influent: 2.30–16.9 WWTPs primary effluent: 2.77–10.4 WWTPs effluent: 4.38-14.4 Nordiazepam WWTPs influent: 1.68–9.73 WWTPs primary effluent: 2.37-7.23 WWTPs effluent: 3.05–6.56
Wu et al., 2015 [44]	Shanghai (China)	From October to November 2014	Surface water from Huangpu River WWTPs influent WWTPs effluent Drinking water	Diazepam Oxazepam Estazolam Temazepam Alprazolam Bromazepam Lorazepam	Diazepam Surface water: 24.3 Drinking water: 1.9 WWTPs influent: 9.5 WWTPs effluent: 9.7 Oxazepam Surface water: 3.3 WWTPs influent: 9.2 WWTPs effluent: 6.8 Estazolam Surface water: 1.2 WWTPs influent: 6.1 WWTPs effluent: 2.9 Temazepam Surface water: 1.3 Drinking water: 0.2 WWTPs influent: 10.6 WWTPs effluent: 2.3 Alprazolam Surface water: 2.5 Drinking water: 2.4 WWTPs influent: 7.6 WWTPs effluent: 4.9 Lorazepam

					Surface water: 4.0 WWTPs influent: 35.8 Bromazepam WWTPs influent: 2.3 WWTPs effluent: 4.2
Zhao et al., 2015 [45]	Yangtze Estuary (China)	July 20 th - 31 st , 2013	Surface water	Diazepam	<i>Mean (±SD)</i> 2.19 (±1.07)
Andreu et al., 2016 [46]	Pego-Oliva marsh Natural Park, Valencia (Spain)	June 11 th , 2013	Surface water from channels and rivers in the natural park area	Diazepam	<i>Min-max range</i> <LOD-12
Aymerich et al., 2016 [47]	Puigcerdà (Spain)	October 8 th - 11 th , 2012	WWTP influents WWTP effluents River water from the Segre River	Diazepam Nordiazepam	<i>Mean (±SD)</i> Diazepam WWTP influent: 4 (±5) WWTP effluent: 2 (±0.6) Surface water: 0.14 (±0.12) Nordiazepam WWTP influent: 6 (±6) WWTP effluent: 7 (±2)
Brieudes et al., 2016 [48]	Pont de Tolbiac Île de la Cité Pont du Garigliano (France)	September 17 th , 2013	Surface water from Seine River	Diazepam Nordazepam Oxazepam Przepam Tetrazepam	<i>Mean (±expanded uncertainties)</i> Diazepam <u>Pont de Tolbiac</u> : 0.230 (±0.039) <u>Île de la Cité</u> : 0.23 (±0.04) <u>Pont du Garigliano</u> : 0.23 (±0.04) Nordazepam <u>Pont de Tolbiac</u> : 0.926 (±0.032) <u>Île de la Cité</u> : 0.96 (±0.07) <u>Pont du Garigliano</u> : 0.90 (±0.07) Oxazepam <u>Pont de Tolbiac</u> : 48.9 (±5.6) <u>Île de la Cité</u> : 46.27 (±15.63) <u>Pont du Garigliano</u> : 40.66 (±13.74) Przepam <u>Pont de Tolbiac</u> : 0.476 (±0.033) <u>Île de la Cité</u> : 0.46 (±0.11) <u>Pont du Garigliano</u> : 0.43 (±0.10) Tetrazepam <u>Pont de Tolbiac</u> : 0.524 (±0.086) <u>Île de la Cité</u> : 1.85 (±1.56) <u>Pont du Garigliano</u> : 2.06 (±1.74)
Mailler et al., 2016 [49]	Colombes (France)	-	WWTP influent WWTP effluents	Lorazepam Oxazepam	<i>Mean (±SD)</i> Lorazepam WWTP influent: 15 (±10) Oxazepam WWTP influent: 239 (±110) WWTP effluent 1: 39 (±18) WWTP effluent 2: 159 (±91)
Mackuľak et al., 2016a [50]	Petržalka (Slovakia)	March 6 th – 12 th , 2013	WWTP influent WWTP effluent	Oxazepam	<i>Mean (±RSD)</i> WWTP influent: 124 (±1) WWTP effluent: 112 (±1)
Mackuľak et al., 2016b [51]	Slovakia Czech Republic	From March to October 2013	WWTPs effluents	Oxazepam	<i>Range of mean values (±SD)</i> Bratislava: 66 (±4) - 116 (±9) Petržalka: 89 (±7) - 129 (±9) Košice: 163 (±14) - 194 (±17) Prešov: 173 (±12) - 401 (±33) B. Bystrica: 14 (±1) - 24 (±2) Zvolen: 86 (±7) - 184 (±15) Trenčín: 31 (±2) - 139 (±8) Piešťany: 48 (±4) - 66 (±6)
Mackuľak et al., 2016c [52]	Slovakia	From March to October 2013	WWTP influent	Oxazepam	<i>Min-max range</i> <LOQ - 228
Mackuľak et al., 2016d [53]	Bratislava (Slovakia) Vsetín (Czech Republic)	April 14 th , 2015	Hospital wastewater effluent	Oxazepam Midazolam	<i>Min-max range</i> Oxazepam : 17-113 Midazolam : <LOQ-37
Paíga et al., 2016 [54]	Leiria district (Portugal)	From August 2013 to June 2014	WWTPs influent WWTPs effluent Surface water from Lis River upstream and downstream of WWTPs	Diazepam	<i>Min-max range</i> WWTP effluent: <LOD- 45.5
Pereira et al., 2016 [55]	North region Center region Lisbon and Tagus Valley region Alentejo region Algarve region (Portugal)	From May 14 th to June 4 th , 2013 (spring) From July 11 th to August 14 th , 2013 (summer) From October 24 th to November 7 th , 2013 (autumn) From January 30 th to February 11 th , 2014 (winter)	WWTP influents WWTP effluents	Lorazepam	<i>Min-max range</i> WWTP influents (spring): 38.4 - 475.8 WWTP effluents (spring): 22.8 - 399.8

Thomaidis et al., 2016 [56]	Athens (Greece)	December 5 th - 11 th , 2010 April 3 rd - 10 th , 2011 April 2 nd - 9 th , 2012 March 6 th - 16 th , 2013 March 11 th - 18 th , 2014	WWTP influent	7-aminoflunitrazepam Alprazolam Bromazepam Diazepam Flunitrazepam Lorazepam Midazolam Nitrazepam Oxazepam Temazepam	<i>Min-max range</i> 7-aminoflunitrazepam April 2012: <LOD-28.5 March 2013: 12.2-54.8 March 2014: <LOD-46.5 Alprazolam April 2011: <LOD-8.0 April 2012: <LOD-7.5 March 2013: 3.1-19.5 March 2014: 4.9-10.3 Bromazepam April 2011: <LOD-11.6 April 2012: 5.5-20.4 March 2013: 7.9-24.1 March 2014: 15.9-47.9 Diazepam December 2010: <LOD-4.8 April 2011: <LOD-6.6 April 2012: <LOD-4.1 March 2013: <LOD-6.7 March 2014: <LOD-2.8 Lorazepam December 2010: 14.1-30.2 April 2011: 29.3-63.9 April 2012: 53.2-87.2 March 2013: 64.7-112.7 March 2014: 80.6-115.3 Midazolam March 2013: <LOD-6.6 March 2014: 2.5-17.1 Nitrazepam April 2012: <LOD-12.4 March 2013: 9.6-31.2 March 2014: <LOD-20.0 Nordiazepam April 2012: <LOD-6.8 March 2013: <LOD-6.4 March 2014: <LOD-5.6 Oxazepam December 2010: 9.3-16.1 April 2011: 21.3-39.1 April 2012: 44.4-86.0 March 2013: 55.8-108.5 March 2014: 185.2-361.4 Temazepam December 2010: <LOD-6.3 April 2011: <LOD-5.5 April 2012: 3.5-7.7 March 2013: 2.3-10.9 March 2014: 7.3-19.8
Aydin S. et al., 2017 [57]	Konya (Turkey)	-	WWTP influent WWTP effluent	Diazepam Lorazepam	<i>Min-max range</i> Diazepam WWTP effluent: <LOD-0.21 Lorazepam WWTP influent: <LOD-4.8 WWTP effluent: <LOD-2.2
Brieudes et al., 2017 [58]	Seine River Basin (France)	Four-month period in 2016	Surface water from Seine River	3-hydroxybromazepam Alprazolam Bromazepam Clonazepam Diazepam Lorazepam Lormetazepam Nordazepam Oxazepam Prazepam Tetrazepam	<i>Min-max range</i> 3-Hydroxybromazepam : 1.53 - 3.30 Bromazepam : <LOQ - 0.73 Diazepam : <LOQ - 0.38 Lorazepam : <LOQ - 3.02 Lormetazepam : <LOQ - 0.80 Nordazepam : <LOQ - 1.47 Oxazepam : 8.21 - 51.0 Prazepam : 0.10 - 1.22 Tetrazepam : 0.12 - 1.52
Burns et al., 2017 [59]	York (United Kingdom)	February 2015	Surface water from Ouse and Foss rivers	Diazepam	<i>Median</i> 1.0
Fick et al., 2017 [60]	United Kingdom Czech Republic Germany Austria Slovak Republic Hungary Croatia Serbia Romania Bulgaria Italy	From April 30 th , 2013 to June 25 th , 2014	Surface waters from Aire, Calder, Blanice, Danube, Ems, Rhine, Tiber and Weser rivers and tributaries	Alprazolam Bromazepam Clobazam Diazepam Flunitrazepam Midazolam Oxazepam Prazepam Temazepam	<i>Min-max range</i> Alprazolam Danube: <LOQ - 1.6 Rhine: <LOQ - 3.5 Bromazepam Ems: 45 - 150 Rhine: <LOQ - 91 Weser: <LOQ - 320 Clobazam Danube: <LOQ - 11 Diazepam Aire: <LOQ - 1.4 Blanice: <LOQ - 1.2

					Danube: <LOQ - 2.3 Ems: <LOQ - 2.3 Rhine: <LOQ - 2.8 Weser: <LOQ - 1.0 Flunitrazepam Blanice: <LOQ - 1.1 Danube: <LOQ - 2.0 Rhine: <LOQ - 2.0 Weser: <LOQ - 2.0 Midazolam Aire: <LOQ - 0.6 Blanice: <LOQ - 1.5 Danube: <LOQ - 2.3 Oxazepam Aire: <LOQ - 17 Calder: <LOQ - 22 Blanice: <LOQ - 20 Danube: <LOQ - 15 Ems: 14 - 37 Rhine: 8.0 - 61 Tiber: 1.4 - 2.3 Weser: 3.1 - 16 Prazepam Blanice: <LOQ - 1.7 Danube: <LOQ - 4.4 Temazepam Aire: <LOQ - 39 Calder: <LOQ - 38 Blanice: <LOQ - 5.4 Danube: <LOQ - 6.7 Ems: <LOQ - 14 Rhine: <LOQ - 17
Kårelid et al., 2017 [61]	Käppala Uppsala Västerås (Sweden)	From January to December 2014	WWTP effluent	Oxazepam	<i>Mean (±SD)</i> Käppala: 178 (±165) Uppsala: 330 (±72) Västerås: 741 (±1248)
Mackuľak et al., 2017 [62]	Bratislava-Petržalka Bratislava-Devínska Nová Ves Nitra Piešťany (Slovakia) Valašské Meziříčí Vsetín Zubří (Czech Republic)	February 27 th , 2014 March 14 th , 2014 July 7 th and 23 rd , 2014 August 18 th , 2014 September 23 rd , 2014 February 11 th , 2015	WWTPs effluent	Oxazepam	<i>Min-max range</i> 19-82
Mastroianni et al., 2017 [63]	Barcelona (Spain)	March 2011 March 2012 March 2013 March 2014 March 2015	WWTP influent	Diazepam	<i>Min-max range</i> 2012: 16-65 2013: <LOQ-14 2014: 13-21 2015: 13-22
Schroeder et al., 2017 [64]	Minnesota Wisconsin (United States)	Summer 2012	WWTPs influents WWTPs effluents Surface water from St. Croix River	Diazepam Nordiazepam Temazepam	<i>Single values</i> Diazepam North Branch WWTP Effluent: 2 Chisago WWTP Effluent: 1.24 Chisago Downstream: 2.85 Nordiazepam North Branch WWTP Effluent: 9.44 Chisago WWTP Effluent: 23.8 Chisago Downstream: 25.3 Temazepam North Branch WWTP Effluent: 91.7 Chisago WWTP Effluent: 71.8 Chisago Downstream: 71.4
Subedi et al., 2017 [65]	State of Karnataka (India)	May 19, 2013 May 25, 2013	STP influent STP effluent	Lorazepam Alprazolam Diazepam Oxazepam Nordiazepam	<i>Min-max range</i> Lorazepam STP influent: <LOD-95 STP effluent: <LOD-47 Alprazolam STP influent: <LOQ-69 STP effluent: <LOD-57 Diazepam STP influent: <LOD-85 STP effluent: 3.0-100 Oxazepam STP influent: <LOQ-210 STP effluent: <LOD-210 Nordiazepam STP influent: <LOQ-17 STP effluent: <LOD-25.0
Wang et al., 2017 [66]	Beijing (China)	From June 30 th to August 6 th , 2013 (summer)	STP influents STP effluents	Diazepam Nordiazepam Temazepam	<i>Range of mean values (±SD)</i> Diazepam

		November 14 th – 24 th , 2013 (winter)	Surface water from Qinghe, Liangshui, South Moat, and Tonghui rivers	Oxazepam	Summer STP influent: 0.9 (±0.6) - 7.1 (±8.9) Winter STP influent: 0.8 (±0.4) - 3.3 (±1.3) Summer STP effluent: 1.3 (±0.3) - 3.2 (±1.1) Tonghui River: 2.4 - 50.4 Qing River: 2.2 - 10.6 Liangshui River: 2.2 - 3.1 South Moat River: 23.4 - 79.7 Oxazepam Summer STP influent: 2.9 (±0.4) - 12.4 (±4.4) Winter STP influent: 9.3 (±6.9) - 19.2 (±6.6) Summer STP effluent: 8.6 (±0.8) - 9.8 (±3.8) Tonghui River: 13.1 - 67.8 Qing River: 3.2 - 61.1 Liangshui River: 3.0 - 25.1 South Moat River: 6.2 - 7.7 Nordiazepam Summer STP influent: 1.0 (±0.9) - 1.5 (±0.7) Winter STP influent: 1.6 (±0.8) - 1.6 (±0.9) Summer STP effluent: 1.0 (±0.1) - 1.5 (±0.4) Tonghui River: <LOQ-4.2 Temazepam Summer STP influent: 1.5 (±1.0) - 3.4 (±0.7) Winter STP influent: 2.2 (±0.5) - 3.3 (±0.1) Summer STP effluent: 2.3 (±0.2) - 2.7 (±0.8) Tonghui River: T5 2.8 - 7.1 Qing River: Q3 2.1 - 13.1 Liangshui River: 3.7 - 7.4 South Moat River: 3.3 - 6.8
Burns et al., 2018 [67]	York (United Kingdom)	From January to December 2016	WWTP influent WWTP effluent Surface water from Ouse and Foss rivers	Diazepam Oxazepam Temazepam	<i>Range of mean values (±SD)</i> Diazepam River Foss: <LOQ - 2.3 WWTP influent: 1.5 (±0.2) – 2.8 (±0.4) WWTP effluent: 2.1 (±0.3) – 2.9 (±0.2) Oxazepam WWTP influent: 22.3 (±1.1) – 37.2 (±4.5) WWTP effluent: 15.7 (±1.6) – 32.8 (±7.7) Temazepam River Foss: <LOQ - 38.2 River Ouse: <LOQ - 7.2 WWTP influent: 27.6 (±2.1) – 88.3 (±4.9) WWTP effluent: 48.9 (±6.9) – 66.4 (±2.1)
Böger et al., 2018 [68]	Curitiba (Brazil)	May 2013 June 2013 July 2013 October 2013 May 2014 June 2014 July 2014 October 2014	Surface water from Belém River	Diazepam	<i>Min-max range</i> <LOQ-763
Gushgari et al., 2018 [69]	United States	From August to December 2017	University campus raw wastewater	Alprazolam	<i>Mean (±SD)</i> 3.6 (±0.1)
Khan et al., 2018 [70]	Mardan District (Pakistan)	From October to November 2016	Domestic wastewater Surface water from Kabul and Indus rivers	Diazepam Bromazepam Temazepam	<i>Min-max range</i> Diazepam Domestic wastewater: 28–33 Surface water: 27-27.5 Bromazepam Domestic wastewater: 7–20 Surface water: 4.3-5.9 Temazepam Domestic wastewater: 9–10 Surface water: 1.9-3.2
Klančar et al., 2018 [71]	Kokra River Ledava River Paka River Savinja River Lake Zbilje (Slovenia)	Spring 2016	Surface water from Kokra, Ledava, Paka and Savinja rivers and Lake Zbilje	Oxazepam	<i>Min-max range</i> <LOQ - 0.43
Nguyen et al., 2018 [72]	Ho Chi Minh City (Vietnam)	December 8 th - 14 th , 2015	WWTP influent WWTP effluent	Temazepam	<i>Min-max range</i> WWTP influent: 0.82–2.9

		December 20 th - 22 nd , 2015			
Skees et al., 2018 [73]	Kentucky (United States)	October 2 nd - 8 th , 2017	WWTP influent WWTP effluent Surface water from Bee Creek and Clarks River	Lorazepam Alprazolam Diazepam Oxazepam Temazepam	<i>Mean (±SD)</i> Lorazepam WWTP influent: 30.4 (±6.0) WWTP effluent: 28.1 (±11.5) Bee Creek: 15.8 (±3.9) Alprazolam WWTP influent: 8.30 (±2.4) WWTP effluent: 11.6 (±9.9) Bee Creek: 6.10 (±2.4) Clarks River downstream: 2.40 (±0.8) Oxazepam WWTP influent: 54.1 (±6.3) WWTP effluent: 59.7 (±12.5) Bee Creek: 34.5 (±8.4) Clarks River downstream: 22.5 (±4.5) Temazepam WWTP influent: 89.4 (±10.4) WWTP effluent: 87.2 (±11.9) Bee Creek: 60.9 (±22.2) Clarks River upstream: 3.40 (±1.0) Clarks River downstream: 28.7 (±9.4)
Xiang et al., 2018 [74]	Shanghai (China)	November 2015	Hospital WWTPs effluent Surface water from Huangpu River downstream the WWTPs Groundwater close to surface water sample sites	Alprazolam Bromazepam Diazepam Estazolam Lorazepam Nordiazepam Oxazepam Temazepam	<i>Min-max range</i> Alprazolam Hospital effluents: 0.28 - 6.44 Surface water: 0.09 - 0.33 Bromazepam Hospital effluents: 0.06 - 2.88 Surface water: 2.58 - 3.72 Diazepam Hospital effluents: 0.57 - 2.86 Surface water: 15.26 - 79.33 Groundwater: 0.15 - 1.05 Estazolam Hospital effluents: 0.72 - 1.37 Surface water: 0.53 - 1.06 Groundwater: ND - 14.41 Lorazepam Hospital effluents: 1.70 - 22.26 Surface water: 3.21 - 8.27 Groundwater: ND - 46.83 Nordiazepam Hospital effluents: 0.08 - 2.42 Surface water: 0.44 - 1.22 Oxazepam Hospital effluents: 1.00 - 11.63 Surface water: 4.95 - 7.96 Groundwater: ND - 16.47 Temazepam Hospital effluents: 0.19 - 8.39 Surface water: 1.15 - 2.40 Groundwater: ND - 3.81
Fernández-Rubio et al., 2019 [75]	Rías Baixas (Spain)	July 2015	Surface water from Ría de Muros e Noia, Ría de Arousa, and Ría de Pontevedra coastal waters	Alprazolam α-Hydroxylalprazolam Diazepam Lorazepam α-Hydroxymidazolam Lormetazepam Temazepam Oxazepam	<i>Min-max range</i> Alprazolam : ND - 10.80 α-Hydroxylalprazolam : ND - 12.90 Diazepam : ND - 5.22 Lorazepam : ND - 95.90 α-Hydroxymidazolam : ND - 5.05 Lormetazepam : ND - 42.80 Temazepam : ND - 23.60 Oxazepam : ND - 59.00
Guruge et al., 2019 [76]	Sri Lanka	May 2013	Surface water from rivers, streams, wastewater canals, freshwater lakes, a coastal lagoon, and an ornamental fish culturing site	Oxazepam Lorazepam Diazepam	<i>Min-max range</i> Oxazepam : <LOQ-2.70 Lorazepam : <LOQ-2.00 Diazepam : <LOQ-1.42
Guzel et al., 2019 [77]	Çukurova Region (Turkey)	From September 2013 to August 2014	Surface water from Ceyhan River	Diazepam	<i>Min-max range</i> <LOQ - 374.00
Croft et al., 2020 [78]	Kentucky (United States)	From July 31 st to August 6 th , 2018	WWTP influent	Alprazolam Diazepam Lorazepam Oxazepam Temazepam	<i>Range of mean values (±SD)</i> Alprazolam 24.2 (±0.72) - 26.6 (±1.34) Diazepam <LOD - 5.74 (±1.03) Lorazepam 14.2 (±4.23) - 23.1 (±3.36) Oxazepam 6.38 (±1.06) - 8.38 ±1.89 Temazepam 23.5 (±3.88) - 57.2 (±7.86)

Fonseca et al., 2020 [79]	Spain	June 2018 September 2018 February 2019	Surface water from the Mijares River	Alprazolam Lorazepam	<i>Min-max range</i> Alprazolam <LOQ-20 Lorazepam <LOQ-94
Mackuľak et al., 2020 [80]	Slovakia Czech Republic	-	WWTP influent WWTP effluent	Oxazepam	<i>Min-max range</i> WWTP influent: <LOD – 230 WWTP effluent: <LOD – 210
Picó et al., 2020 [81]	Saudi Arabia	Winter 2017-2018	Surface water from Al Asfar and Al Hubail lakes	Alprazolam Lorazepam	<i>Min-max range</i> Alprazolam <LOD-389.4 Lorazepam 415.2-506.7
Rehrl et al., 2020 [82]	Mälaren Lake (Sweden)	From February to November 2017	Surface water and depth profiles from Mälaren Lake	Diazepam Oxazepam	<i>Min-max range</i> Diazepam : <LOQ - 0.11 Oxazepam : <LOQ - 8.7
Topaz et al., 2020 [83]	Alexander micro-estuary (Israel)	From 2016 to 2018	Surface water	Lorazepam	<i>Min-max range</i> 0-4
Wang et al., 2020 [84]	China	Winter 2018 Spring 2019	Tap water	Alprazolam Diazepam Hydroxy-Alprazolam Hydroxy-Midazolam Lorazepam Lormetazepam Midazolam Oxazepam Temazepam	<i>Min-max range</i> Alprazolam : <LOQ-0.06 Diazepam : <LOD-24.91 Hydroxy-Alprazolam : <LOQ-0.06 Hydroxy-Midazolam : <LOQ-0.03 Lorazepam : <LOQ-0.04 Lormetazepam : <LOQ-0.65 Midazolam : <LOQ-0.03 Oxazepam : <LOQ-0.13 Temazepam : <LOQ-1.01
Álvarez-Ruiz et al., 2021 [85]	Goodna (Australia)	From March to December 2017	Surface water from the Brisbane River estuary WWTP effluent	Desmethyl-diazepam Temazepam	<i>Min-max range</i> Desmethyl diazepam <LOD-2.2 Temazepam <LOD-28.11
Ávila et al., 2021 [86]	Barcelona (Spain)	From June to July 2015	WWTP influent WWTP effluent	Lorazepam	<i>Min-max range</i> WWTP influent: 241–892
Björklund and Svahn, 2021 [87]	Scania county (Sweden)	April 4 th - 5 th , 2017	WWTP influent WWTP effluent	Oxazepam	<i>Min-max range</i> 95 - 475
Dehm et al., 2021 [88]	Viti Levu (Fiji Islands)	From December 2017 to March 2018	Surface water from the Pacific Ocean	Alprazolam Clonazepam Flunitrazepam Oxazepam	<i>Min-max range</i> Alprazolam : 10-29 Clonazepam : 5.1-17 Flunitrazepam : 20-94 Oxazepam : 1.0-190
Escolà Casas et al., 2021 [89]	Barcelona Girona (Spain)	October 16 th - 20 th , 2019	WWTP influents	Lorazepam	<i>Mean (±RSD)</i> Barcelona: 180 (±10) Girona: 70 (±10)
Fernandes et al., 2021 [90]	Tagus River estuary (Portugal)	June 18 th , 2019	Surface water from the Tagus River estuary downstream a WWTP	α-Hydroxyalprazolam	<i>Mean (±SD)</i> 4.3 (±0.5)
García-Galán et al., 2021 [91]	Barcelona (Spain)	July	WWTP influent WWTP effluent	Lorazepam Oxazepam Diazepam	<i>Mean (±SD)</i> Lorazepam WWTP effluent: 511 (±113) Oxazepam WWTP effluent: 284 (±60) Diazepam WWTP effluent: 7 (±1)
Lei et al., 2021 [92]	Guangdong province (China)	From November 2018 to April 2019	WWTP influent WWTP effluent	Alprazolam Diazepam Estazolam Midazolam Nordiazepam Oxazepam Temazepam	<i>Min-max range</i> Alprazolam WWTP influent: <LOD–0.98 WWTP effluent: 0.18–0.94 Diazepam WWTP influent: 1.19–4.40 WWTP effluent: 0.84–3.14 Estazolam WWTP influent: 0.37–4.50 WWTP effluent: 0.47–0.97 Lorazepam WWTP effluent: <LOD–12.6 Oxazepam WWTP influent: 2.38–5.29 WWTP effluent: <LOD–3.99 Nordiazepam WWTP influent: <LOD–2.17 WWTP effluent: <LOD–0.57 Temazepam WWTP effluent: <LOD–12.6
Mir-Tutusaus et al., 2021 [93]	Barcelona (Spain)	-	Hospital wastewater	Lorazepam	<i>Min-max range</i> 538 ± 178
Suzuki et al., 2021 [94]	Shinkawa Hirose Tama Tsurumi Shonai	From September 2015 to August 2016 From February 2017 to April 2018	Surface water from Shinkawa, Hirose, Tama, Tsurumi, Shonai, Katsura and Chikugo rivers STP influents	Lorazepam	<i>Max concentration</i> Surface water: 7.3 STP influents: 26

	Katsura Chikugo Rivers (Japan)		STP effluents		
Tang et al., 2021 [95]	Yangtze River Delta (China)	December 2016 March 2017 June 2017 September 2017	Surface water from Zhangxi and Lu rivers	Diazepam Oxazepam	<i>Range of mean values (±SD)</i> Diazepam Lu River: 0.72±1.23 - 11.74 (±9.76) Zhangxi River: 0.07±0.34 - 0.64±3.13 Oxazepam Lu River: 11.5 (±5.07) - 24.8 (±11.5) Zhangxi River: 4.54 (±5.69) - 9.74 (±7.44)
Abdel-Gawad and Alamri, 2022 [96]	Cairo (Egypt)	-	WWTP effluent of a pharmaceutical industrial plant	Bromazepam Diazepam	<i>Min-max range</i> Bromazepam : 20590-44890 Diazepam : 22760-41830
Asare, 2022 [97]	Korle Lagoon (Ghana)	February 2021	Surface water from Korle Lagoon	Diazepam Lorazepam	<i>Min-max range</i> Diazepam : 5.71 - 19.07 Lorazepam : <LOQ - 4.02
Cibati et al., 2022 [98]	Spain	From March to May 2017	Urban WWTP secondary effluents Low-load greywater from a hotel Psychiatric hospital WWTP effluent Metoprolol-producing pharmaceutical industry WWTP effluent	Lorazepam	<i>Mean (±SD)</i> Urban WWTP secondary effluents:108 (±14) Psychiatric hospital WWTP effluent: 93 (±40)
Golbaz et al., 2022 [99]	Tehran (Iran)	November 2019 July 2020	WWTP influent WWTP secondary clarifier effluent WWTP final effluent	Alprazolam	<i>Mean (±SD)</i> WWTP influent: 1.88 (±0.0) WWTP secondary clarifier effluent: 5.09 (±2.33) WWTP final effluent: 3.86 (±2.28)
Hidrovo et al., 2022 [100]	New Hampshire (United States)	March 2019 July 2019	WWTP influent WWTP effluent Surface water from the Great Bay Estuary	Diazepam	<i>Min-max range</i> WWTP influent: <LOQ - 3.8 WWTP effluent: 1.3 - 13.0
Leiviskä and Risteelä, 2022 [101]	Oulu (Finland)	January 2 nd , 2019 February 26 th , 2019 April 23 rd , 2019 June 26 th , 2019 August 20 th , 2019 October 15 th , 2019 November 28 th , 2019	WWTP influent WWTP membrane bioreactor effluent WWTP conventional activated sludge effluent	Oxazepam Temazepam	<i>Min-max range</i> Oxazepam WWTP influent: 68–4300 WWTP membrane bioreactor effluent: 150-4200 WWTP conventional activated sludge effluent: 150-5700 Temazepam WWTP influent: 290–2900 WWTP membrane bioreactor effluent: 320-2500 WWTP conventional activated sludge effluent: 320-2800
Mahjoub et al., 2022 [102]	Nabeul district (Tunisia)	From June 2013 to May 2016	WWTP effluent Storage basin of WWTP effluents	Oxazepam	<i>Mean</i> WWTP effluent: 16 Storage basin: 25
Ogunbanwo et al., 2022 [103]	Lagos State (Nigeria)	April 2017 July 2017 October 2017 January 2018	STP effluent Surface water from the Odo-Iya Alaro River	Diazepam Temazepam	<i>Min-max range</i> Diazepam: 320-75031 Temazepam: 15-89
Wilkinson et al., 2022 [104]	World rivers in all continents	-	Surface water (river)	Diazepam Oxazepam Temazepam	<i>Range of mean values</i> Diazepam Africa: 2.03 - 170 Asia: 2.26 -59.56 Europe: 1.73 - 851 North America: 3.79 - 4.02 South America: 29.7 - 31.7 Temazepam Africa 24.9 Asia: 24.9 Europe: 24.9 -1380 North America: 59.6 - 508 Oceania: 161 - 503
Wu et al., 2022 [105]	Pearl River Estuary (China)	June 18 th , 2020 June 20 th , 2020 June 23 rd , 2020 July 6 th - 12 th , 2020	Surface water from Pearl River Estuary	Diazepam	<i>Min-max range</i> Pearl River: 1.03 - 2.12 Lingding Sea: 0.965 - 2.15
Zhang et al., 2022 [106]	Houxi River watershed (China)	January 2017 April 2017 July 2017 October 2017 January 2018 April 2018 July 2018 October 2018 January 2019 April 2019 July 2019	Surface water from Houxi River	Diazepam	<i>Min-max range</i> <LOQ - 5.39

		October 2019			
Adhikari et al., 2023 [107]	Alaska Arizona Florida Illinois Kansas Kentucky New Mexico New Jersey Texas Washington (United States) Chiapas Chihuahua Guanajuato Jalisco Mexico Michoacan Morelos Nuevo Leon Puebla Queretano San Luis Potosi Sonora Tamaulipas Veracruz (Mexico)	From July to October 2020	Raw wastewater	Alprazolam Clonazepam Diazepam Lorazepam Nordiazepam Temazepam	<i>Mean (±SE)</i> Alprazolam Mexico: 56 Clonazepam United States: 53 (±18) Mexico: 36 (±10) Diazepam Mexico: 490 Lorazepam United States: 248 (±90) Mexico: 155 Nordiazepam Mexico: 80 (±30) Temazepam United States: 118 (±22) Mexico: 54 (±10)
Becker et al., 2023 [108]	Porto Alegre (Brazil)	From February 2019 to February 2020	Hospital WWTP effluent	Diazepam	<i>Min-max range</i> 80-810
Lei et al., 2023 [109]	Guangxi Guangdong Shenzhen Dongguan (China)	July 2018 December 2018	Surface water from the Beijing, Xijiang, and Maozhou rivers of the Pearl River basin	Diazepam Nordiazepam 6-CPQ	<i>Min-max range</i> Diazepam : 0.03–25.0 Nordiazepam : 0.24–0.98 6-CPQ : <LOQ–4.57
Lopez-Herguedas et al., 2023 [110]	Vizcaya Alava (Spain)	From April to July 2020	WWTP influents WWTP effluents	Lorazepam	<i>Mean</i> WWTP influent (Vizcaya): 319 WWTP effluent (Vizcaya primary treatment): 619 WWTP effluent (Vizcaya secondary treatment): 605 WWTP effluent (Vizcaya tertiary treatment): 260 WWTP influent (Alava): 142 WWTP effluent (Alava primary treatment): 354
Massano et al., 2023 [111]	Italy	2022	WWTP influents	Lorazepam Lormetazepam Oxazepam Temazepam	<i>Min-max range</i> Lorazepam : 24-160 Lormetazepam : 9-160 Oxazepam : <LOD-36 Temazepam : <LOD-8
Shao et al., 2023 [112]	China	From 2018 to 2021	WWTP influents	Flunitrazepam	<i>Min-max range</i> 3.47 - 4.54
Wang et al., 2023 [113]	Pearl River (China)	August 15 th – 22 nd , 2022	Surface water from Pearl, West, East and North rivers	Diazepam	<i>Min-max range</i> 0.9–93.6
A. Wang et al., 2024 [114]	Guangdong province (China)	March 16 th - 17 th , 2013 April 11 th - 12 th , 2023	WWTPs influent (LJ and GM WWTPs) WWTPs effluent (LJ and GM WWTPs) Surface water from Pearl and West rivers downstream of the WWTPs	Alprazolam Clobazam Diazepam Estazolam Lorazepam Nordiazepam Oxazepam Temazepam	<i>Mean (±SD)</i> Alprazolam Pearl River 0.46 (±0.03) GM WWTP influent 2.13 (±0.07) Clobazam LJ WWTP effluent 0.07 (±0.03) Diazepam LJ WWTP influent 4.61 (±0.27) LJ WWTP effluent 4.57 (±0.07) Pearl River: 4.37 (±0.12) GM WWTP influent 6.40 (±0.16) GM WWTP effluent 6.27 (±0.15) West River: 7.64 (±0.27) Estazolam LJ WWTP effluent 0.55 (±0.01) Pearl River: 0.49 (±0.03) GM WWTP influent 0.15 (±0.01) GM WWTP effluent 0.20 (±0.01) Lorazepam LJ WWTP influent 2.17 (±0.48) LJ WWTP effluent 1.63 (±0.78) Pearl River: 1.53 (±0.03) GM WWTP influent 5.33 (±0.63)

					GM WWTP effluent 3.28 (±0.10) West River: 7.32 (±0.35) Nordiazepam LJ WWTP effluent 0.22 (±0.06) Pearl River: 0.32 (±0.02) GM WWTP influent 0.42 (±0.04) GM WWTP effluent 0.39 (±0.01) West River: 0.31 (±0.04) Oxazepam LJ WWTP influent 8.91 (±0.39) LJ WWTP effluent 9.6 (±0.29) Pearl River: 9.16 (±0.29) GM WWTP influent 10.9 (±0.20) GM WWTP effluent 10.5 (±0.37) West River: 0.31 (±0.04) Temazepam LJ WWTP influent 0.41 (±0.05) LJ WWTP effluent 0.48 (±0.06) Pearl River: 0.71 (±0.06) GM WWTP influent 0.97 (±0.02) GM WWTP effluent 1.05 (±0.02) West River: 0.37 (±0.02)
Gracia-Lor et al., 2024 [115]	Valencian Community Catalonia Castilla-La Mancha Community of Madrid (Spain)	December 2020 May 2021 June 2021 December 2021	WWTPs influents	Diazepam Lormetazepam Lorazepam	<i>Min-max range</i> Diazepam: 3-40 Lormetazepam: 22-86 Lorazepam: 55-248
Li et al., 2024 [116]	Beijing Guangzhou Jieyang Tianshui Shanghai Shenzen Wuzhou (China)	January 6 th - 12 th , 2021 March 7 th - 13 th , 2021 March 15 th - 21 st , 2021 June 2 nd - 8 th , 2021 July 30 th , 2021 August 1 st - 5 th , 2021 September 14 th - 20 th , 2021 October 17 th - 23 rd , 2021 October 25 th - 31 st , 2021	WWTPs influents WWTPs effluents	Temazepam	<i>Mean</i> WWTP influent: 2.18 WWTP effluent: 1.87
Robinson et al., 2024 [117]	Hampshire (United Kingdom)	From November 2021 to August 2022	Surface water from Itchen and Test rivers	Alprazolam Oxazepam	Alprazolam River Itchen: <LOD-51.7 River Test: <LOD-62.3 Oxazepam River Itchen: <LOD-0.35 River Test: 0.4-4.7
Ting et al., 2024 [118]	Taipei (Taiwan)	From September 2021 to June 2022 From November 2023 to January 2024	WWTPs influent	Alprazolam 7-Aminoclonazepam Estazolam 7-Aminoflunitrazepam Midazolam Bromazepam Diazepam Nitrazepam Flurazepam	<i>Range of mean values</i> 7-aminoclonazepam: 14-637 7-aminoflunitrazepam: 15-580 Alprazolam: 8-521 Bromazepam: <LOD-243 Diazepam: <LOD-4751 Estazolam: 5-457 Flurazepam: <LOD-11 Midazolam: 2-125 Nitrazepam: <LOD-105
W. Wang et al., 2024 [119]	Qiantangjiang basin Oujiang basin Jiaojiang basin Yongjiang basin Tiaoxi basin Yunhe basin (China)	Winter 2018	Tap water	OH-Alprazolam Diazepam Lormetazepam Oxazepam Temazepam	<i>Min-max range</i> OH-Alprazolam: <LOQ-0.1 Diazepam: <LOQ-22.4 Lormetazepam: <LOQ-0.11 Oxazepam: <LOQ-0.42 Temazepam: <LOQ-1.39

Abbreviations: LOD = limit of detection; ND = not detected; WWTP = wastewater treatment plant; STP = sewage treatment plant.

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