Probabilistic environmental risk assessment of fivpe nanomaterials (nano-TiO_2, nano-Ag, nano-ZnO, CNT, and Fullerenes)

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Supporting Information

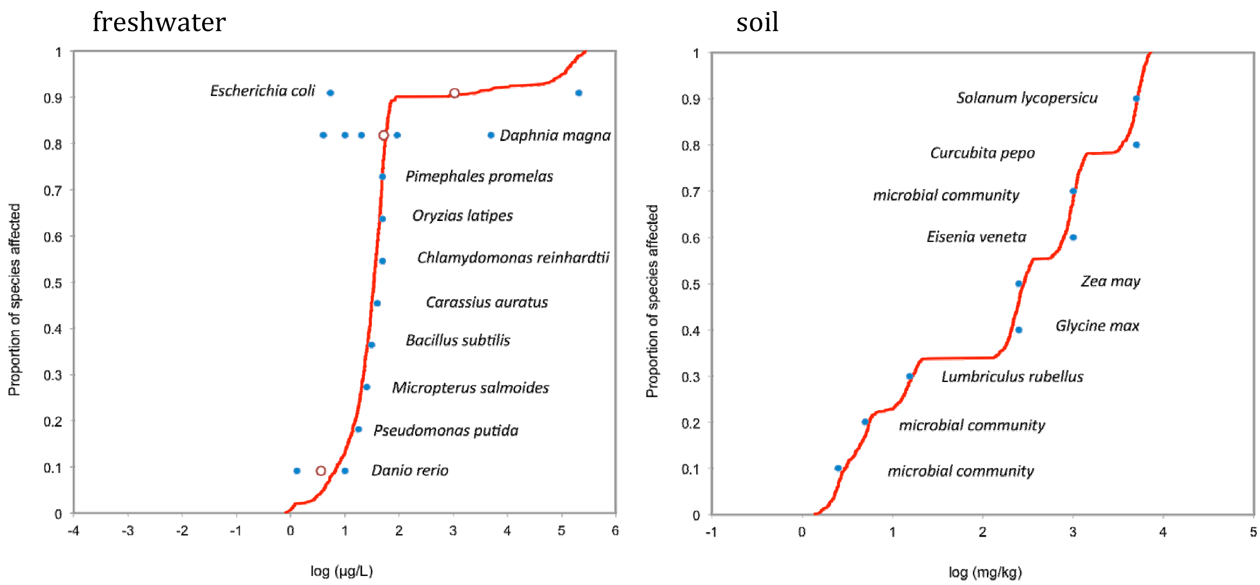

Figure S1: Probabilistic Species Sensitivity Distributions (PSSD) for fullerenes in the freshwater and soil compartments.

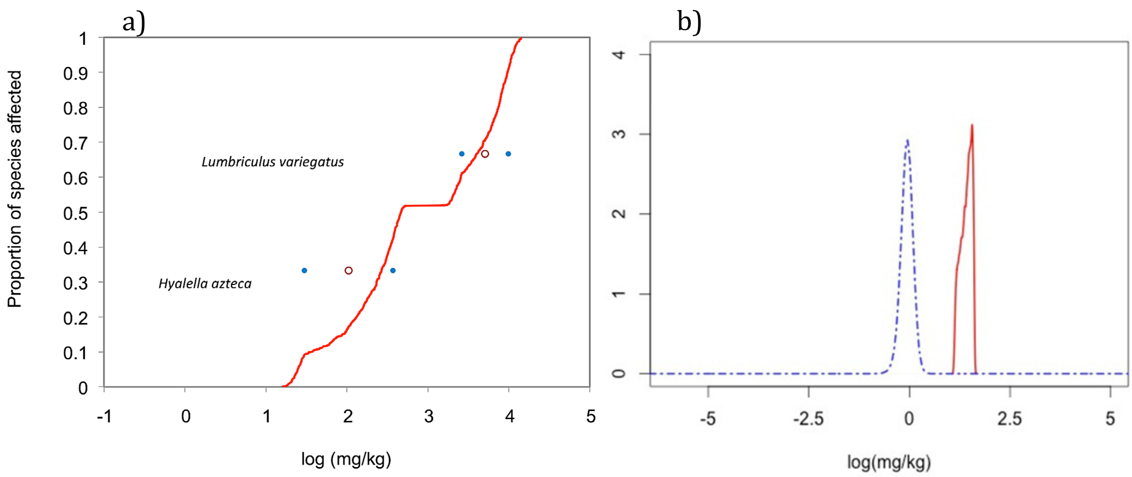

Figure S2: a) Probabilistic Species Sensitivity Distributions (PSSD) for CNTs in the sediment compartment. B) Comparison of predicted environmental concentrations (PEC) in blue and probabilistic species sensitivity distributions (pSSD) in red.

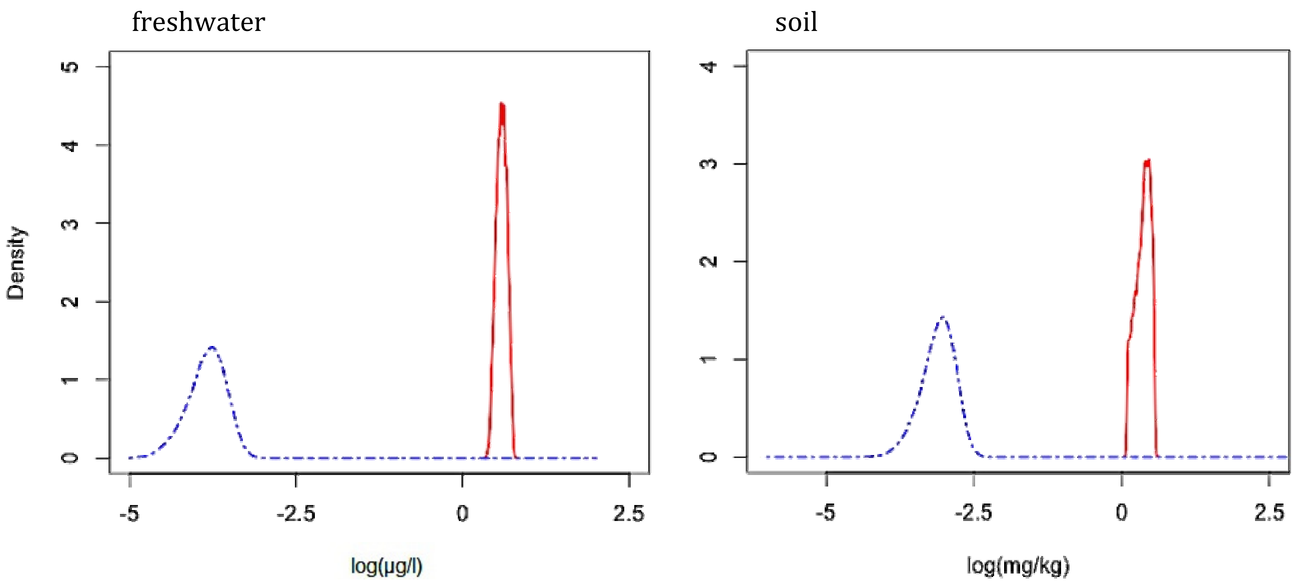

Figure S3: Comparison of predicted environmental concentration (PEC) in blue and probabilistic species sensitivity distribution (pSSD) in red for freshwater and sludge treated soils for fullerenes.

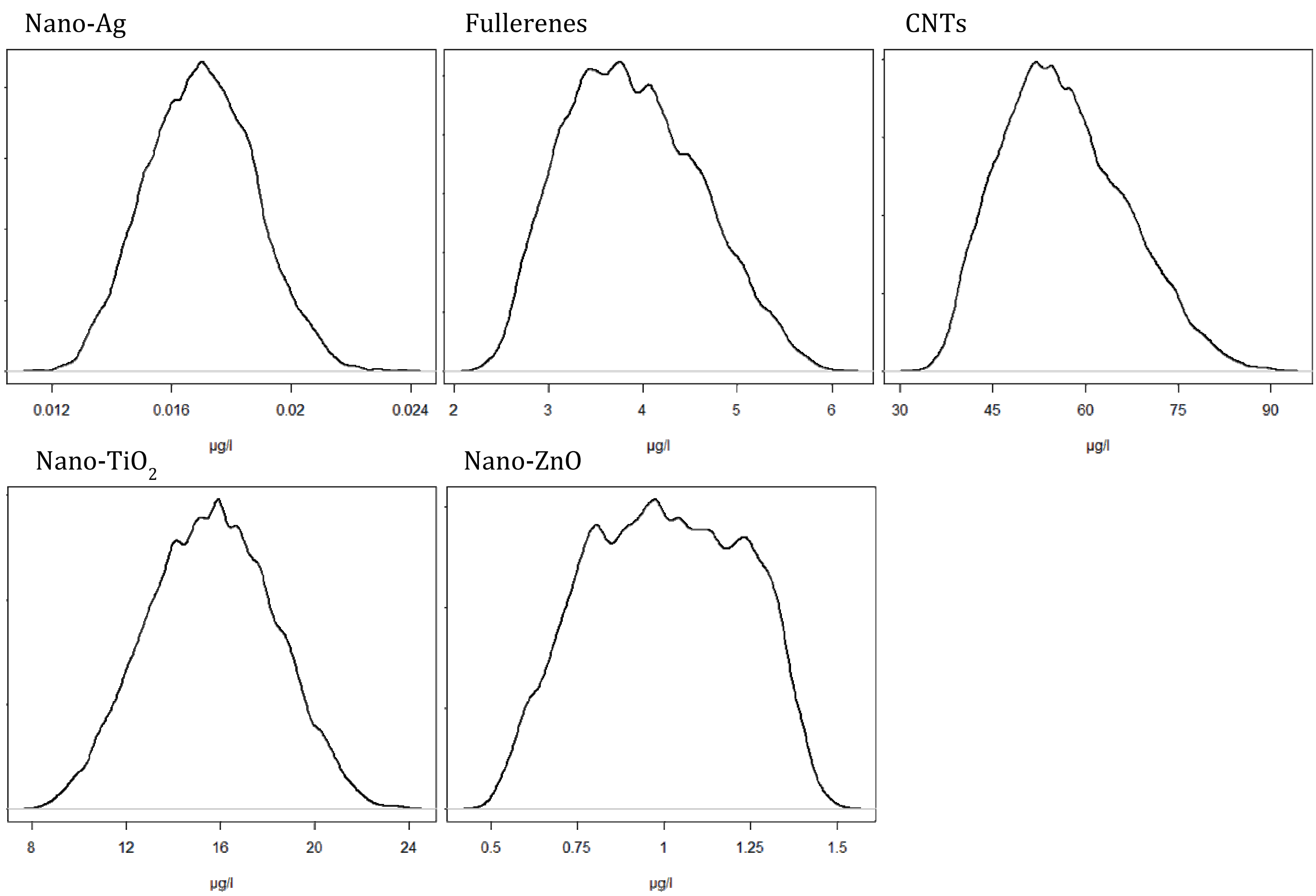

Figure S4: Predicted no-effect concentration distributions for TiO_2, Ag, ZnO, fullerenes and CNT in freshwater.

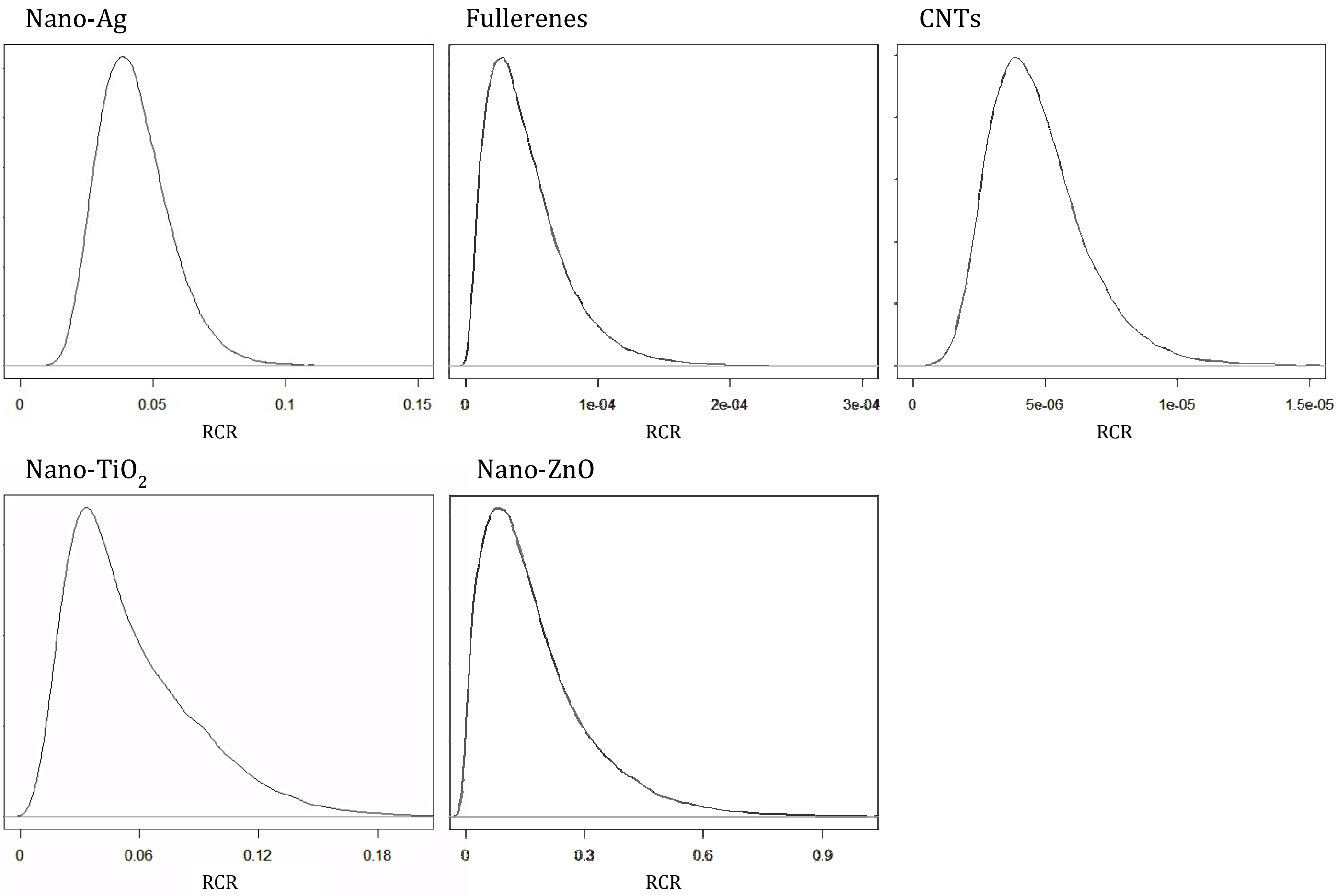

Figure S5: Risk Characterization Factor distributions for TiO_2, Ag, ZnO, fullerenes and CNT in freshwater.

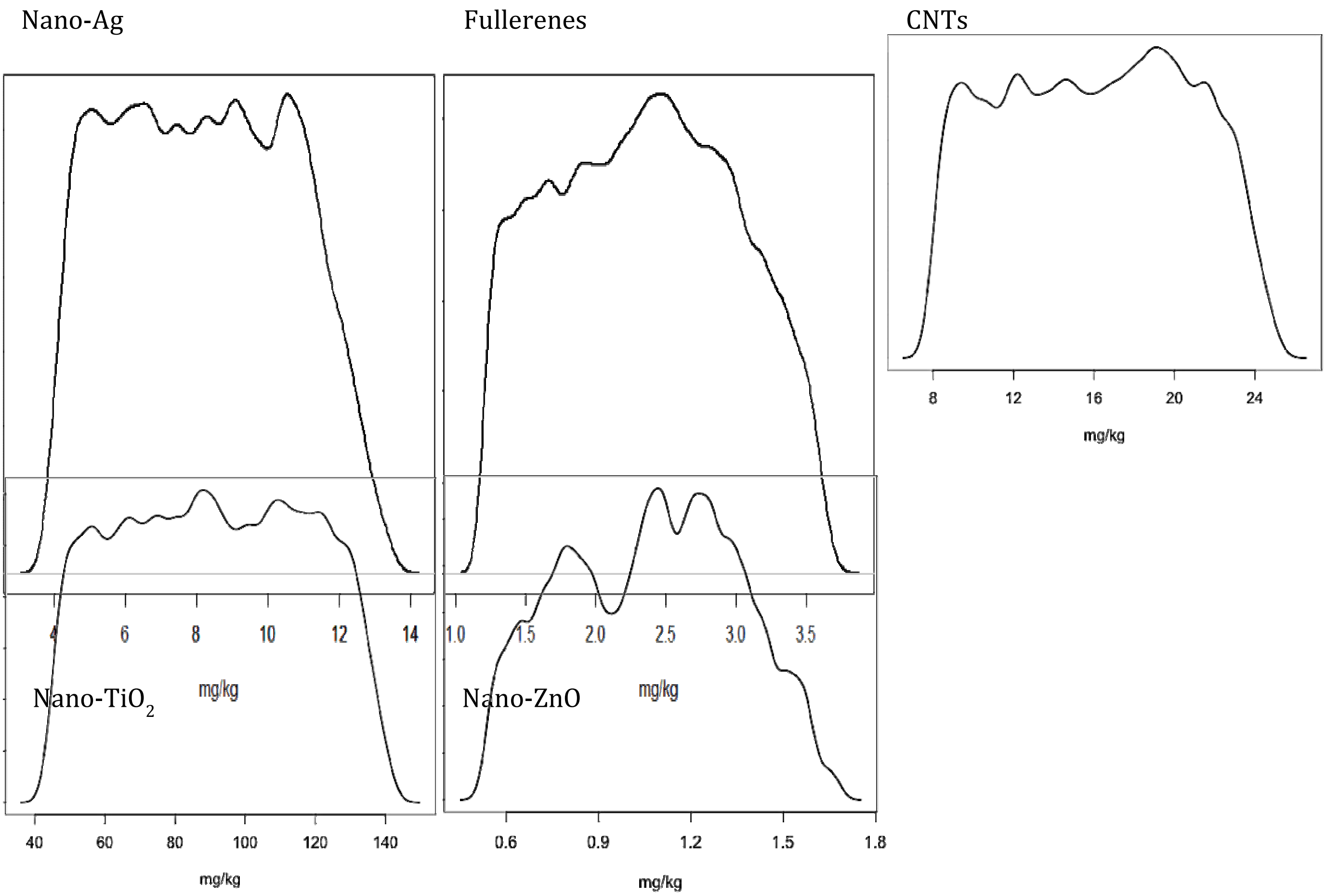

Figure S6: Predicted no-effect concentration distribution for TiO_2, Ag, ZnO, fullerenes and CNT in soil.

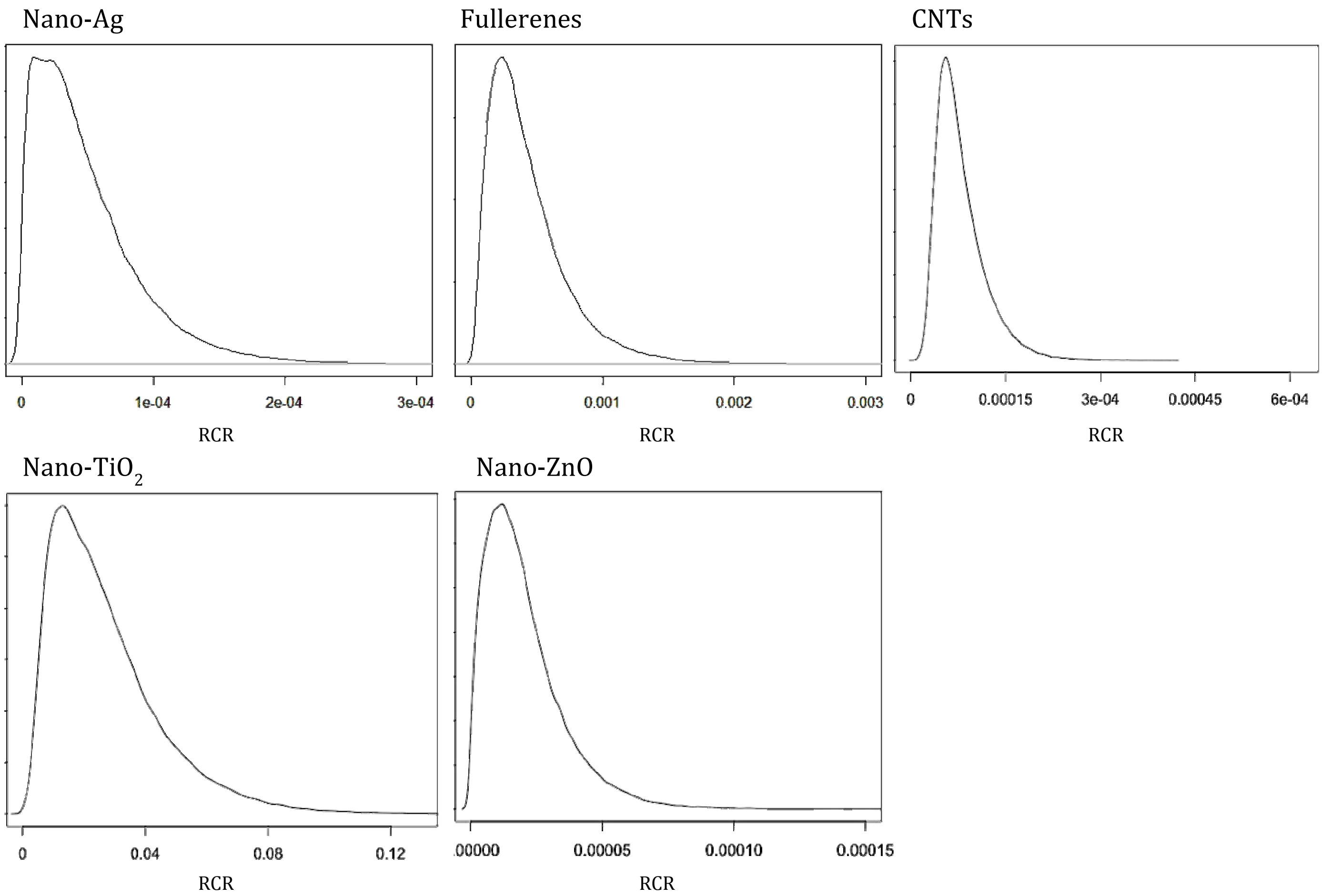

Figure S7: Risk Characterization Factor distributions for TiO_2, Ag, ZnO, fullerenes and CNT in soil.

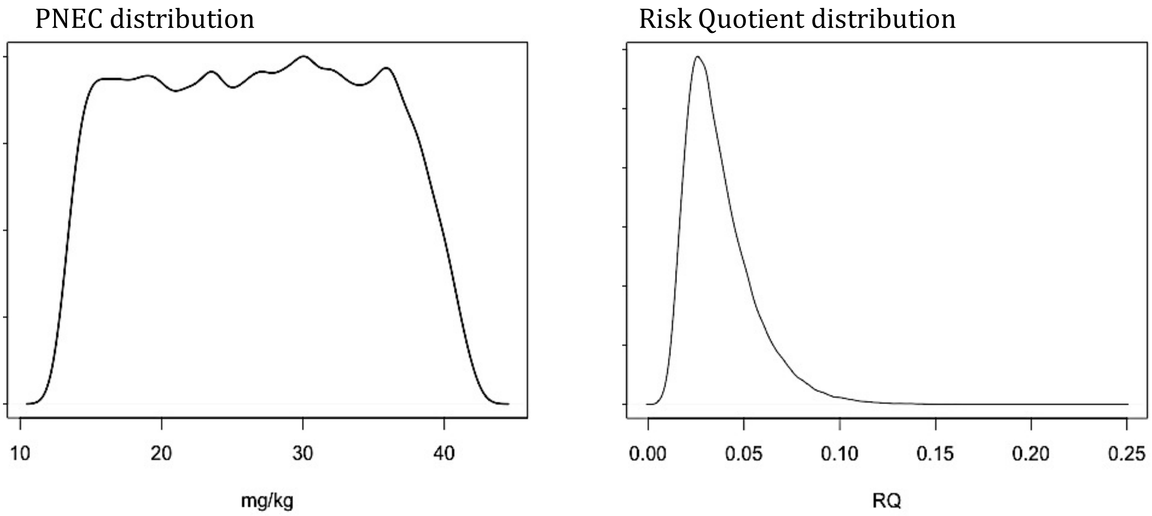

Figure S8: Predicted no-effect concentration distribution and risk quotient distribution for CNTs in sediment.

Table S1: Data for aquatic toxicity for nano-Ag, nano-TiO_2, nano-ZnO, CNT and Fullerenes.

Author	ENM	Dose descriptor	Test organism	Concentration (µg/l)	Exposure time (h)	AF time	AF no-effect	Species sensitivity (µg/l)
Mouchet, et.al. [1]	CNT	HONEC	*Ambystoma mexicanum*	100,000.00	288	10	1	10,000.00
Templeton et al. [2]	CNT	NOEC	*Amphiascus tenuiremis*	1,600.00	720	1	1	1,600.00
Li et al. [3]	CNT	LC50	*Ceriodaphnia dubia, crustacea*	8,000.00	24	10	10	80.00
Alloy, et.al. [4]	CNT	LOEC	*Ceriodaphnia dubia, crustacea*	2,380.00	168	10	2	119.00
Kennedy et al. [5]	CNT	EC50	*Ceriodaphnia dubia, crustacea*	50,900.00	48	10	10	509.00
Long [6]	CNT	IC50	*Chlorella sp.*	12,400.00	96	1	10	1,240.00
Schwab et al. [7]	CNT	NOEC	*Chlorella vulgaris*	42.00	96	1	1	42.00
Schwab et al. [7]	CNT	NOEC	*Chlorella vulgaris*	180.00	96	1	1	180.00
Schwab et al. [7]	CNT	NOEC	*Chlorella vulgaris*	1,000.00	96	1	1	1,000.00
Schwab et al. [7]	CNT	NOEC	*Chlorella vulgaris*	3,000.00	96	1	1	3,000.00
Schwab et al. [7]	CNT	NOEC	*Chlorella vulgaris*	3,000.00	96	1	1	3,000.00
Asharani et al. [8]	CNT	NOEC	*Danio rerio, Zebrafish*	40,000.00	72	10	1	4,000.00
Cheng et al. [9]	CNT	LOEC	*Danio rerio, Zebrafish*	120,000.00	72	10	2	6,000.00
Zhu et al. [10]	CNT	EC50	*Daphnia magna, crustacea*	1,306.00	48	10	10	13.06
Edgington et al. [11]	CNT	LC50	*Daphnia magna, crustacea*	2,000.00	96	10	10	20.00
Zhu et al. [10]	CNT	EC50	*Daphnia magna, crustacea*	8,726.00	48	10	10	87.26
Alloy, et.al. . [4]	CNT	LOEC	*Daphnia magna, crustacea*	240.00	504	1	2	120.00

Roberts et al. [12]	CNT	NOEC	*Daphnia magna, crustacea*	5,000.00	96	10	1	500.00
Schwab et al. [7]	CNT	NOEC	*Pseudokirchneriella subcapitata*	1,300.00	96	1	1	1,300.00
Schwab et al. [7]	CNT	NOEC	*Pseudokirchneriella subcapitata*	3,000.00	96	1	1	3,000.00
Bayat, et.al. [13]	CNT	LED	*Saccharomyces cerevisiae*	7,800.00	16	10	2	390.00
Zhu et al. [14]	CNT	NOEC	*Stylonychia Mytilus*	500.00	120	1	1	500.00
Ghafari et al. [15]	CNT	LOEC	*Tetrahymena thermophila, protozoa*	3,600.00	72	1	2	1,800.00
Mouchet, et.al. [16]	CNT	LOEC	*Xenopus laevis, amphibian*	10,000.00	288	10	2	500.00
Mouchet, et.al. [17]	CNT	LOEC	*Xenopus laevis, amphibian*	50,000.00	288	10	2	2,500.00
Fang, et.al. [18]	Fullerenes	MIC	*Bacillus subtilis, bacteria*	612.37	14	10	2	30.62
Zhu et al. [19]	Fullerenes	NOEC	*Carassius auratus*	40.00	768	1	1	40.00
Luo et al. [20]	Fullerenes	LOEC	*Chlamydomonas reinhardtii, unicellular*	1,000.00	24	10	2	50.00
Isaacson et al. [21]	Fullerenes	LC50	*Danio rerio, Zebrafish*	130.00	12	10	10	1.30
Usenko et al. [22]	Fullerenes	NOEC	*Danio rerio, Zebrafish*	100.00	24	10	1	10.00
Seda [23]	Fullerenes	LC50	*Daphnia magna, crustacea*	400.00	96	10	10	4.00
Tao, et.al. [24]	Fullerenes	LOEC	*Daphnia magna, crustacea*	200.00	48	10	2	10.00
Lovern et al. [25]	Fullerenes	NOEC	*Daphnia magna, crustacea*	200.00	48	10	1	20.00
Zhu et al. [26]	Fullerenes	NOEC	*Daphnia magna, crustacea*	500.00	192	10	1	50.00
Zhu et al. [27]	Fullerenes	EC50	*Daphnia magna, crustacea*	9,344.00	48	10	10	93.44
Oberdörster et al. [28]	Fullerenes	HONEC	*Daphnia magna, crustacea*	5,000.00	504	1	1	5,000.00
Ivask, et.al. [29]	Fullerenes	EC50	*Escherichia coli*	20,800,000.00	2	10	10	208,000.00

Oberdöster, et.al. [30]	Fullerenes	LOEC	*Micropterus salmoides, Largemouth bass*	500.00	48	10	2	25.00
Oberdörster et al. [28]	Fullerenes	HONEC	*Oryzias latipes, japanese rice fish*	500.00	96	10	1	50.00
Oberdörster et al. [28]	Fullerenes	HONEC	*Pimephales promelas, fathead minnow*	500.00	96	10	1	50.00
Fang, et.al. [18]	Fullerenes	MIC	*Pseudomonas putida, bacteria*	353.55	14	10	2	17.68
Gao, et.al. [31]	Nano-Ag	HONEC	*ammonia-oxidizing bacteria (AOB)*	200.00	408	1	1	200.00
Luo, et.al. [32]	Nano-Ag	HONEC	*ammonia-oxidizing bacteria (AOB)*	2,000.00	1080	1	1	2,000.00
Jin [33]	Nano-Ag	IC50	*Bacillus subtilis, bacteria*	3,000.00	24	10	10	30.00
Yoon et al. [34]	Nano-Ag	LC50	*Bacillus subtilis, bacteria*	11,000.00	24	10	10	110.00
Jin [33]	Nano-Ag	IC50	*Bacillus subtilis, bacteria*	46,000.00	24	10	10	460.00
Roh et al. [35]	Nano-Ag	LOEC	*Caenorhabditis elegans, roundworm*	100.00	72	10	2	5.00
Kim et al. [36]	Nano-Ag	NOEC	*Caenorhabditis elegans, roundworm*	1,000.00	24	10	10	10.00
Meyer et al. [37]	Nano-Ag	LOEC	*Caenorhabditis elegans, roundworm*	5,000.00	48	10	2	250.00
Kim et al. [36]	Nano-Ag	LC50	*Caenorhabditis elegans, roundworm*	55,000.00	24	10	10	550.00
Angel [38]	Nano-Ag	IC50	*Ceriodaphnia dubia, crustacea*	0.15	72	10	10	0.002
Gao et al. [39]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	0.69	48	10	10	0.01
Gao et al. [39]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	0.77	48	10	10	0.01
Angel [38]	Nano-Ag	IC50	*Ceriodaphnia dubia, crustacea*	2.00	72	10	10	0.02
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	3.00	48	10	10	0.03

Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	4.80	48	10	10	0.05
Gao et al. [39]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	6.18	48	10	10	0.06
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	8.80	48	10	10	0.09
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	10.00	48	10	10	0.10
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	11.00	48	10	10	0.11
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	19.00	48	10	10	0.19
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	26.00	48	10	10	0.26
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	26.70	48	10	10	0.27
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	29.00	48	10	10	0.29
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	38.10	48	10	10	0.38
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	41.40	48	10	10	0.41
Kennedy et al. [40]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	45.00	48	10	10	0.45
Griffit et al. [41]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	67.00	48	10	10	0.67
McLaughlin [42]	Nano-Ag	LC50	*Ceriodaphnia dubia, crustacea*	433.00	48	10	10	4.33
Nair, et.al. [43]	Nano-Ag	HONEC	*Chironomus riparius*	1,000.00	24	10	1	100.00
Navarro et al. [44]	Nano-Ag	EC50	*Chlamydomonas reinhardtii, unicellular*	0.86	5	10	10	0.01
Navarro [44]	Nano-Ag	EC50	*Chlamydomonas reinhardtii, unicellular*	3.53	1	10	10	0.04
Navarro [44]	Nano-Ag	EC50	*Chlamydomonas reinhardtii, unicellular*	6.10	1	10	10	0.06

Wang et al. [45]	Nano-Ag	EC50	*Chydorus sphaericus (cladoceran species)*	8.63	48	10	10	0.09
Wang et al. [45]	Nano-Ag	EC50	*Chydorus sphaericus (cladoceran species)*	12.94	48	10	10	0.13
Wang et al. [45]	Nano-Ag	EC50	*Chydorus sphaericus (cladoceran species)*	30.20	48	10	10	0.30
Massarsky [46]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	1.18	96	10	10	0.01
Kaewamatawong [47]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	1.78	48	10	10	0.02
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	8.45	48	10	10	0.08
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	34.50	48	10	10	0.35
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	45.50	48	10	10	0.46
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	61.00	48	10	10	0.61
Wang et al. [45]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	84.14	48	10	10	0.84
Bilberg [49]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	89.00	48	10	10	0.89
Wang et al. [45]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	146.70	48	10	10	1.47
Wang et al. [45]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	173.67	48	10	10	1.74
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	205.00	48	10	10	2.05
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	228.00	48	10	10	2.28
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	351.00	48	10	10	3.51
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	370.00	48	10	10	3.70
Muth-Köhne [50]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	1,000.00	48	10	10	10.00
Muth-Köhne [50]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	1,200.00	24	10	10	12.00
Muth-Köhne [50]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	1,200.00	48	10	10	12.00

Muth-Köhne [50]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	1,900.00	24	10	10	19.00
van Aerle [51]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	1,912.80	48	10	10	19.13
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	2,427.00	48	10	10	24.27
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	3,043.00	48	10	10	30.43
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	3,091.00	48	10	10	30.91
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	3,455.00	48	10	10	34.55
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	5,891.00	48	10	10	58.91
Cunningham [48]	Nano-Ag	EC50	*Danio rerio, Zebrafish*	6,922.00	48	10	10	69.22
Griffit et al. [41]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	7,070.00	48	10	10	70.70
Asharani et al. [52]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	35,355.34	72	10	10	353.55
Choi, et.al. [53]	Nano-Ag	LC50	*Danio rerio, Zebrafish*	250,000.00	24	10	10	2,500.00
Völker [54]	Nano-Ag	EC10	*Daphnia galeata crustacea*	11.00	48	10	2	0.55
Völker [54]	Nano-Ag	EC10	*Daphnia galeata crustacea*	3.45	504	1	2	1.73
Lee[55]	Nano-Ag	EC50	*Daphnia magna, crustacea*	0.75	48	10	10	0.01
Kim et al. [56]	Nano-Ag	EC50	*Daphnia magna, crustacea*	1.00	48	10	10	0.01
Zhao et al. [57]	Nano-Ag	LC50	*Daphnia magna, crustacea*	1.10	48	10	10	0.01
Allen, et.al. [58]	Nano-Ag	LC50	*Daphnia magna, crustacea*	1.10	48	10	10	0.01
Georgantzopoulou [59]	Nano-Ag	EC50	*Daphnia magna, crustacea*	1.20	48	10	10	0.01
Kim et al. [56]	Nano-Ag	EC50	*Daphnia magna, crustacea*	1.40	48	10	10	0.01

Poynton [60]	Nano-Ag	EC50	*Daphnia magna, crustacea*	1.80	24	10	10	0.02
Kennedy et al. [61]	Nano-Ag	LC50	*Daphnia magna, crustacea*	1.80	48	10	10	0.02
Zhao et al. [57]	Nano-Ag	LC50	*Daphnia magna, crustacea*	2.00	48	10	10	0.02
Asghari [62]	Nano-Ag	EC50	*Daphnia magna, crustacea*	2.00	48	10	10	0.02
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	2.14	48	10	10	0.02
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	2.27	48	10	10	0.02
Das, et.al. [64]	Nano-Ag	LC50	*Daphnia magna, crustacea*	2.75	48	10	10	0.03
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	3.16	48	10	10	0.03
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	3.41	48	10	10	0.03
Li et al. [65]	Nano-Ag	LC50	*Daphnia magna, crustacea*	3.46	48	10	10	0.03
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	3.48	48	10	10	0.03
Li et al. [65]	Nano-Ag	LC50	*Daphnia magna, crustacea*	4.00	48	10	10	0.04
Asghari [62]	Nano-Ag	EC50	*Daphnia magna, crustacea*	4.00	48	10	10	0.04
Jo [66]	Nano-Ag	EC50	*Daphnia magna, crustacea*	4.20	24	10	10	0.04
Kennedy et al. [61]	Nano-Ag	LC50	*Daphnia magna, crustacea*	5.30	48	10	10	0.05
Kennedy et al. [61]	Nano-Ag	LC50	*Daphnia magna, crustacea*	5.40	48	10	10	0.05
Kennedy et al. [61]	Nano-Ag	LC50	*Daphnia magna, crustacea*	5.40	48	10	10	0.05
Li et al. [65]	Nano-Ag	LC50	*Daphnia magna, crustacea*	6.00	48	10	10	0.06
Hoheisel [67]	Nano-Ag	LC50	*Daphnia magna, crustacea*	7.00	48	10	10	0.07

Das, et.al. [64]	Nano-Ag	NOEC	*Daphnia magna, crustacea*	0.75	48	10	1	0.08
Lee [55]	Nano-Ag	EC50	*Daphnia magna, crustacea*	7.98	48	10	10	0.08
Li et al. [65]	Nano-Ag	LC50	*Daphnia magna, crustacea*	10.00	48	10	10	0.10
Stensberg [68]	Nano-Ag	LC50	*Daphnia magna, crustacea*	10.10	72	10	10	0.10
Poynton [60]	Nano-Ag	EC50	*Daphnia magna, crustacea*	10.60	24	10	10	0.11
Kennedy et al. [61]	Nano-Ag	LC50	*Daphnia magna, crustacea*	11.10	48	10	10	0.11
Jo [66]	Nano-Ag	EC50	*Daphnia magna, crustacea*	12.40	24	10	10	0.12
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	13.08	48	10	10	0.13
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	14.04	48	10	10	0.14
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	14.09	48	10	10	0.14
Jo [66]	Nano-Ag	EC50	*Daphnia magna, crustacea*	14.30	24	10	10	0.14
Newton [63]	Nano-Ag	LC50	*Daphnia magna, crustacea*	14.81	48	10	10	0.15
Kennedy et al. . [61]	Nano-Ag	LC50	*Daphnia magna, crustacea*	14.90	48	10	10	0.15
Kennedy et al. . [61]	Nano-Ag	LC50	*Daphnia magna, crustacea*	17.70	48	10	10	0.18
Georgantzopoulou [59]	Nano-Ag	EC50	*Daphnia magna, crustacea*	20.00	48	10	10	0.20
Hoheisel [67]	Nano-Ag	LC50	*Daphnia magna, crustacea*	27.00	48	10	10	0.27
Zhao et al. [57]	Nano-Ag	LC50	*Daphnia magna, crustacea*	28.70	48	10	10	0.29
Völker [54]	Nano-Ag	EC10	*Daphnia magna, crustacea*	0.92	504	1	2	0.46
Kennedy et al. [61]	Nano-Ag	LC50	*Daphnia magna, crustacea*	97.00	48	10	10	0.97

Georgantzopoulou [59]	Nano-Ag	EC50	*Daphnia magna, crustacea*	120.00	48	10	10	1.20
Asghari [62]	Nano-Ag	EC50	*Daphnia magna, crustacea*	187.00	48	10	10	1.87
Zhao et al. [69]	Nano-Ag	LOEC	*Daphnia magna, crustacea*	5.00	504	1	2	2.50
Völker [54]	Nano-Ag	EC10	*Daphnia magna, crustacea*	60.30	48	10	2	3.02
Jo [66]	Nano-Ag	EC50	*Daphnia magna, crustacea*	531.50	24	10	10	5.32
Pokhrel [70]	Nano-Ag	EC50	*Daphnia magna, crustacea*	798.00	48	10	10	7.98
Jo [66]	Nano-Ag	EC50	*Daphnia magna, crustacea*	1,153.90	24	10	10	11.54
Jo [66]	Nano-Ag	EC50	*Daphnia magna, crustacea*	1,404.60	24	10	10	14.05
Jo [66]	Nano-Ag	EC50	*Daphnia magna, crustacea*	3,844.10	24	10	10	38.44
Zhao et al. [69]	Nano-Ag	HONEC	*Daphnia magna, crustacea*	500.00	48	10	1	50.00
Blinova et al. [71]	Nano-Ag	EC50	*Daphnia magna, crustacea*	40,200.00	48	10	10	402.00
Blinova et al. [71]	Nano-Ag	EC50	*Daphnia magna, crustacea*	49,400.00	48	10	10	494.00
Blinova et al. [71]	Nano-Ag	EC50	*Daphnia magna, crustacea*	263,300.00	48	10	10	2,633.00
Völker [54]	Nano-Ag	EC10	*Daphnia pulex, crustacea*	4.37	48	10	2	0.22
Griffit et al.	Nano-Ag	LC50	*Daphnia pulex, crustacea*	40.00	48	10	10	0.40
Völker [54]	Nano-Ag	EC10	*Daphnia pulex, crustacea*	2.25	504	1	2	1.13
Georgantzopoulou [59]	Nano-Ag	EC50	*Desmodesmus subspicatus*	34.00	72	1	10	3.40
Georgantzopoulou [59]	Nano-Ag	EC50	*Desmodesmus subspicatus*	330.00	72	1	10	33.00
Georgantzopoulou [59]	Nano-Ag	EC50	*Desmodesmus subspicatus*	2,200.00	72	1	10	220.00
Martinez-Castañon, et.al. [72]	Nano-Ag	MIC	*Escherichia coli*	6.25	24	10	2	0.31

Pokhrel [73]	Nano-Ag	EC50	*Escherichia coli*	800.00	5	10	10	8.00
Pokhrel [73]	Nano-Ag	EC50	*Escherichia coli*	4,170.00	5	10	10	41.70
Pokhrel [73]	Nano-Ag	EC50	*Escherichia coli*	5,790.00	5	10	10	57.90
Yoon et al. [34]	Nano-Ag	LC50	*Escherichia coli*	31,000.00	24	10	10	310.00
Ivask, et.al. [29]	Nano-Ag	EC50	*Escherichia coli*	45,900.00	2	10	10	459.00
Funck, et.al. [74]	Nano-Ag	LC50	*Gammarus fossaru, ampiphod*	1.01	96	10	10	0.01
Gubbins, et.al. [75]	Nano-Ag	EC50	*Lemna minor, duck weed*	19.06	336	10	10	0.19
Kim et al. [76]	Nano-Ag	NOEC	*Lemna paucicostata, duck weed*	100.00	168	10	1	10.00
Ali, et.al. [77]	Nano-Ag	LC50	*Lymnaea luteola, snail*	48.10	96	10	10	0.48
Miao [78]	Nano-Ag	EC50	*Ochromonas danica, chrysophyte*	5.30	48	10	10	0.05
Govindasamy, et al [79]	Nano-Ag	LC50	*Oreochromis mossambicus, tilapia*	12,600.00	192	10	10	126.00
Kim et al. [56]	Nano-Ag	LC50	*Oryzias latipes, japanese rice fish*	28.00	96	10	10	0.28
Chae [80]	Nano-Ag	LC50	*Oryzias latipes, japanese rice fish*	34.60	96	10	10	0.35
Kim et al. [56]	Nano-Ag	LC50	*Oryzias latipes, japanese rice fish*	67.00	96	10	10	0.67
Wu, et.al. [81]	Nano-Ag	LC50	*Oryzias latipes, japanese rice fish*	1,030.00	48	10	10	10.30
Kashiwada, et.al. [82]	Nano-Ag	LC50	*Oryzias latipes, japanese rice fish*	1,390.00	96	10	10	13.90
Kim et al. [83]	Nano-Ag	LC50	*Oryzias latipes, japanese rice fish*	1,440.00	96	10	10	14.40
Kvitek et al. [84]	Nano-Ag	LC50	*Paramecium caudatum*	39,000.00	1	10	10	390.00
Kvitek et al. [84]	Nano-Ag	NOEC	*Paramecium caudatum*	25,000.00	168	1	1	25,000.00
Bilberg [85]	Nano-Ag	HONEC	*Perca fluviatilis*	300.00	20	10	1	30.00
Angel [38]	Nano-Ag	IC50	*Phaeodactylum tricornutum*	2,380.00	72	1	10	238.00

Angel [38]	Nano-Ag	IC50	*Phaeodactylum tricornutum*	3,690.00	72	1	10	369.00
Kennedy et al. [61]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	9.00	48	10	10	0.09
Kennedy et al. [61]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	19.20	48	10	10	0.19
Kennedy et al. [61]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	41.00	48	10	10	0.41
Kennedy et al. [61]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	55.20	48	10	10	0.55
Kennedy et al. [61]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	60.70	48	10	10	0.61
Kennedy et al. [61]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	64.10	48	10	10	0.64
Kennedy et al. [61]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	69.90	48	10	10	0.70
Hoheisel [67]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	89.40	96	10	10	0.89
Kennedy et al. [61]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	125.80	48	10	10	1.26
Hoheisel [67]	Nano-Ag	EC20	*Pimephales promelas, fathead minnow*	46.10	168	10	2	2.31
Laban et al. [86]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	1,250.00	96	10	10	12.50
Laban et al. [86]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	1,303.84	96	10	10	13.04
Laban et al. [86]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	1,360.00	96	10	10	13.60
Laban et al. [86]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	9,400.00	96	10	10	94.00
Laban et al. [86]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	9,981.98	96	10	10	99.82
Laban et al. [86]	Nano-Ag	LC50	*Pimephales promelas, fathead minnow*	10,600.00	96	10	10	106.00
Angel [38]	Nano-Ag	IC50	*Pseudokirchneriella subcapitata*	3.00	72	1	10	0.30
Angel [38]	Nano-Ag	IC50	*Pseudokirchneriella subcapitata*	19.50	72	1	10	1.95
Griffit et al. [41]	Nano-Ag	EC50	*Pseudokirchneriella subcapitata*	190.00	96	1	10	19.00
McLaughlin [42]	Nano-Ag	IC50	*Pseudokirchneriella subcapitata*	22,600.00	96	1	1	22,600.00
Jin [33]	Nano-Ag	IC50	*Pseudomonas putida, bacteria*	3,000.00	24	10	10	30.00
Jin [33]	Nano-Ag	IC50	*Pseudomonas putida, bacteria*	50,000.00	24	10	10	500.00
Wang et al. [45]	Nano-Ag	EC50	*Raphidocelis subcapitata*	896.39	4.5	10	10	8.96
Wang et al. [45]	Nano-Ag	EC50	*Raphidocelis subcapitata*	4,006.23	4.5	10	10	40.06
Wang et al. [45]	Nano-Ag	EC50	*Raphidocelis subcapitata*	21,142.19	4.5	10	10	211.42
Debabrata, et.al. [87]	Nano-Ag	MIC	*Saccharomyces cerevisiae*	48.51		10	2	2.43
Niazi, et.al. [88]	Nano-Ag	EC30	*Saccharomyces cerevisiae*	15,101.56	2	10	2	755.08

Bayat, et.al. [13]	Nano-Ag	LED	*Saccharomyces cerevisiae*	15,600.00	16	10	2	780.00
Jiang [89]	Nano-Ag	EC50	*Spirodela polyrhiza, duckweed*	4,540.00	72	10	10	45.40
Jiang [89]	Nano-Ag	EC50	*Spirodela polyrhiza, duckweed*	13,390.00	72	10	10	133.90
Jiang [89]	Nano-Ag	EC50	*Spirodela polyrhiza, duckweed*	13,670.00	72	10	10	136.70
Jiang [89]	Nano-Ag	EC50	*Spirodela polyrhiza, duckweed*	16,100.00	72	10	10	161.00
Jiang [89]	Nano-Ag	EC50	*Spirodela polyrhiza, duckweed*	17,330.00	72	10	10	173.30
Martinez-Castañon, et.al. [72]	Nano-Ag	MIC	*Staphylococcus aureus*	7.50	24	10	2	0.38
Burchardt[90]	Nano-Ag	EC50	*Synechococcus, bacteria sp.*	355.97	72	1	10	35.60
Juganson [91]	Nano-Ag	EC50	*Tetrahymena thermophila, protozoa*	205,000.00	24	10	10	2,050.00
Juganson [91]	Nano-Ag	EC50	*Tetrahymena thermophila, protozoa*	286,000.00	2	10	10	2,860.00
Blinova et al. [71]	Nano-Ag	LC50	*Thamnocephalus platyurus*	68,800.00	48	10	10	688.00
Blinova et al. [71]	Nano-Ag	LC50	*Thamnocephalus platyurus*	178,000.00	48	10	10	1,780.00
Blinova et al. [71]	Nano-Ag	LC50	*Thamnocephalus platyurus*	191,500.00	48	10	10	1,915.00
Blinova et al. [71]	Nano-Ag	LC50	*Thamnocephalus platyurus*	250,000.00	48	10	10	2,500.00
Blinova et al. [71]	Nano-Ag	LC50	*Thamnocephalus platyurus*	252,000.00	48	10	10	2,520.00
Cherchi et al. [92]	Nano-TiO2	EC50	*Anabaena variabilis*	620.00	96	1	10	62.00
Adams et al. [93]	Nano-TiO2	NOEC	*Bacillus subtilis, bacteria*	500,000.00	14 - 20	10	1	50,000.00
Clement, et.al. [94]	Nano-TiO2	EC50	*Brachionus plicatili, rotifer*	5,370.00	72	10	10	53.70
Wu, et.al. [95]	Nano-TiO2	LOEC	*Caenorhabditis elegans, roundworm*	50.00	24	10	2	2.50
Wang et al. [96]	Nano-TiO2	LC50	*Caenorhabditis elegans, roundworm*	80,000.00	24	10	10	800.00
Hall et al. [97]	Nano-TiO2	LC50	*Ceriodaphnia dubia, crustacea*	7,600.00	48	10	10	76.00
Hall et al. [97]	Nano-TiO2	IC25	*Ceriodaphnia dubia, crustacea*	8,500.00	168	10	10	85.00
Li et al. [3]	Nano-TiO2	EC50	*Ceriodaphnia dubia, crustacea*	42,000.00	48	10	10	420.00
Wang et al. [98]	Nano-TiO2	LC50	*Ceriodaphnia dubia, crustacea*	400,000.00	24	10	10	4,000.00
Li et al. [99]	Nano-TiO2	LC50	*Chironomus dilutus*	20,000.00	48	10	10	200.00
Wang et al. [100]	Nano-TiO2	NOEC	*Chlamydomonas reinhardtii, unicellular*	1,000.00	120	1	1	1,000.00
Gunawan, et.al. [101]	Nano-TiO2	EC50	*Chlamydomonas reinhardtii, unicellular*	100,000.00	192	1	10	10,000.00
Sadiq et al. [102]	Nano-TiO2	EC50	*Chlorella sp.*	16,120.00	72	1	10	1,612.00

Ji et al. [103]	Nano-TiO2	NOEC	*Chlorella sp.*	16,000.00	144	1	1	16,000.00
Cheng et al. [104]	Nano-TiO2	HONEC	*Danio rerio, Zebrafish*	500.00	4320	1	1	500.00
Xiong et al. [105]	Nano-TiO2	LC50	*Danio rerio, Zebrafish*	124,500.00	96	10	10	1,245.00
Yang [106]	Nano-TiO2	LC50	*Danio rerio, Zebrafish*	156,000.00	24	10	10	1,560.00
Bar-Ilan [107]	Nano-TiO2	LC50	*Danio rerio, Zebrafish*	300,000.00	24	10	10	3,000.00
Zhu et al. [108]	Nano-TiO2	HONEC	*Danio rerio, Zebrafish*	500,000.00	96	10	1	50,000.00
Ma, et.al [109]	Nano-TiO2	LC50	*Daphnia magna, crustacea*	29.80	48	10	10	0.30
Dabrunz et al. [110]	Nano-TiO2	EC50	*Daphnia magna, crustacea*	240.00	96	10	10	2.40
Zhu et al. [111]	Nano-TiO2	NOEC	*Daphnia magna, crustacea*	100.00	72	10	1	10.00
Clement, et.al. [94]	Nano-TiO2	EC50	*Daphnia magna, crustacea*	1,300.00	72	10	10	13.00
Dabrunz et al. [110]	Nano-TiO2	EC50	*Daphnia magna, crustacea*	3,800.00	72	10	10	38.00
Das, et.al. [64]	Nano-TiO2	LC50	*Daphnia magna, crustacea*	7,750.00	48	10	10	77.50
Zhu et al. [111]	Nano-TiO2	NOEC	*Daphnia magna, crustacea*	100.00	504	1	1	100.00
Warheit et al. [112]	Nano-TiO2	NOEC	*Daphnia magna, crustacea*	1,000.00	48	10	1	100.00
Lovern 2006[25]	Nano-TiO2	NOEC	*Daphnia magna, crustacea*	1,000.00	48	10	1	100.00
Kim et al. [113]	Nano-TiO2	LOEC	*Daphnia magna, crustacea*	500.00	504	1	2	250.00
Kim et al. [113]	Nano-TiO2	LOEC	*Daphnia magna, crustacea*	5,000.00	48	10	2	250.00
Jacobasch, et.al. [114]	Nano-TiO2	EC50	*Daphnia magna, crustacea*	2,930.00	504	1	10	293.00
Amiano [115]	Nano-TiO2	EC50	*Daphnia magna, crustacea*	29,700.00	48	10	10	297.00
Zhu et al. [27]	Nano-TiO2	EC50	*Daphnia magna, crustacea*	35,306.00	48	10	10	353.06
Das, et.al. [64]	Nano-TiO2	NOEC	*Daphnia magna, crustacea*	4,100.00	48	10	1	410.00
Jacobasch, et.al. [114]	Nano-TiO2	EC10	*Daphnia magna, crustacea*	4,520.00	504	1	2	2,260.00
Wiench et al. [116]	Nano-TiO2	NOEC	*Daphnia magna, crustacea*	3,000.00	504	1	1	3,000.00
Heinlaan et al. [117]	Nano-TiO2	LC50	*Daphnia magna, crustacea*	20,000,000.00	48	10	10	200,000.00
Hall et al. [97]	Nano-TiO2	LC50	*Daphnia pulex, crustacea*	9,200.00	48	10	10	92.00
Marcone [118]	Nano-TiO2	EC50	*Daphnia similis, crustacea*	12,500.00	48	10	10	125.00
Hund-Rinke et al. [119]	Nano-TiO2	EC50	*Desmodesmus subspicatus*	44,000.00	72	1	10	4,400.00
Bigorgne, et.al. [120]	Nano-TiO2	HONEC	*Eisenia fetida, earthworm*	10,000.00	24	10	1	1,000.00

Dasari, et.al. [121]	Nano-TiO2	LC50	*Escherichia coli*	1,680.00	0.5	10	10	16.80
Ivask, et.al. [29]	Nano-TiO2	EC50	*Escherichia coli*	20,000,000.00	2	10	10	200,000.00
Adams et al. [93]	Nano-TiO2	NOEC	*Escherichia coli*	100,000.00	14 - 20	10	1	10,000.00
Hu et al. [122]	Nano-TiO2	LD50	*Escherichia coli*	1,104,000.00	2	10	10	11,040.00
Bundschuh, et.al. [123]	Nano-TiO2	LOEC	*Gammarus fossaru, ampiphod*	200.00	168	10	2	10.00
Zhu et al. [124]	Nano-TiO2	NOEC	*Haliotis diversicolor supertexta*	2,000.00	10	10	1	200.00
Zhu et al. [124]	Nano-TiO2	EC50	*Haliotis diversicolor supertexta*	56,900.00	10	10	10	569.00
Li et al. [99]	Nano-TiO2	LC50	*Hyalella azteca, amphipod*	20,000.00	48	10	10	200.00
Li et al. [125]	Nano-TiO2	LC50	*Hyalella azteca, amphipod*	631,000.00	96	10	10	6,310.00
Kim et al. [76]	Nano-TiO2	NOEC	*Lemna paucicostata, duck weed*	125,000.00	168	10	1	12,500.00
Li et al. [99]	Nano-TiO2	LC50	*Lumbriculus variegatus*	20,000.00	48	10	10	200.00
Federici, et. Al. [126]	Nano-TiO2	HONEC	*Oncorhynchus mykiss*	1,000.00	168	10	1	100.00
Warheit et al. [112]	Nano-TiO2	NOEC	*Oncorhynchus mykiss*	1,000.00	96	10	1	100.00
Ma, et.al[109]	Nano-TiO2	LC50	*Oryzias latipes, japanese rice fish*	2,460.00	96	10	10	24.60
Li et al. [127]	Nano-TiO2	LC50	*Paramecium multi-micronucleatum*	7,215,200.00	48	1	10	721,520.00
Clement, et.al. [94]	Nano-TiO2	EC50	*Phaeodactylum tricornutum*	10,910.00	72	1	10	1,091.00
Hall et al. [97]	Nano-TiO2	IC25	*Pimephales promelas, fathead minnow*	452,000.00	168	10	10	4,520.00
Hall et al. [97]	Nano-TiO2	LC50	*Pimephales promelas, fathead minnow*	500,000.00	48	10	10	5,000.00
Jovanovic, et.al. [128]	Nano-TiO2	HONEC	*Pimephales promelas, fathead minnow*	1,000,000.00	168	10	1	100,000.00
Lee [129]	Nano-TiO2	NOEC	*Pseudokirchneriella subcapitata*	50.00	72	1	1	50.00
Lee [129]	Nano-TiO2	EC50	*Pseudokirchneriella subcapitata*	2,530.00	72	1	10	253.00
Aruoja et al. [130]	Nano-TiO2	NOEC	*Pseudokirchneriella subcapitata*	984.00	72	1	1	984.00
Hall et al. [97]	Nano-TiO2	IC25	*Pseudokirchneriella subcapitata*	1,500.00	96	1	1	1,500.00
Warheit et al. [112]	Nano-TiO2	EC50	*Pseudokirchneriella subcapitata*	16,000.00	72	1	10	1,600.00
Hartmann et al. [131]	Nano-TiO2	EC50	*Pseudokirchneriella subcapitata*	71,000.00	72	1	10	7,100.00
Metzler et al. [132]	Nano-TiO2	EC50	*Pseudokirchneriella subcapitata*	113,000.00	96	1	10	11,300.00
Bayat, et.al. [13]	Nano-TiO2	LED	*Saccharomyces cerevisiae*	7,800.00	16	10	2	390.00
Kasemets [133]	Nano-TiO2	HONEC	*Saccharomyces cerevisiae*	20,000,000.00	24	10	1	2,000,000.00

Sadiq et al. [102]	Nano-TiO2	EC50	*Scenedesmus subspicatus*	21,200.00	72	1	10	2,120.00
Velzeboer, et. Al. [134]	Nano-TiO2	HONEC	*soil bacteria*	100,000.00	168	1	1	100,000.00
Heinlaan et al. [117]	Nano-TiO2	NOEC	*Thamnocephalus platyurus*	20,000,000.00	24	10	1	2,000,000.00
Nations, et.al. [135]	Nano-TiO2	EC10	*Xenopus laevis, amphibian*	1,000,000.00	96	10	2	50,000.00
Li et al. [136]	Nano-ZnO	IC50	*Bacillus subtilis, bacteria*	280.00	24	10	10	2.80
Li et al. [136]	Nano-ZnO	IC50	*Bacillus subtilis, bacteria*	310.00	24	10	10	3.10
Li et al. [136]	Nano-ZnO	IC50	*Bacillus subtilis, bacteria*	3,300.00	24	10	10	33.00
Jones et al. [137]	Nano-ZnO	EC50	*Bacillus subtilis, bacteria*	188,000.00	10	10	10	1,880.00
Wu, et.al. [95]	Nano-ZnO	LOEC	*Caenorhabditis elegans, roundworm*	50.00	24	10	2	2.50
Wang et al. [96]	Nano-ZnO	LC50	*Caenorhabditis elegans, roundworm*	2,300.00	24	10	10	23.00
Ma et al. [138]	Nano-ZnO	EC50	*Caenorhabditis elegans, roundworm*	46,000.00	24	10	10	460.00
Ma et al. [139]	Nano-ZnO	LC50	*Caenorhabditis elegans, roundworm*	70,000.00	24	10	10	700.00
Gunawan, et.al. [101]	Nano-ZnO	EC50	*Chlamydomonas reinhardtii, unicellular*	10.00	192	1	10	1.00
Luo et al. [20]	Nano-ZnO	LOEC	*Chlamydomonas reinhardtii, unicellular*	1,000.00	24	10	2	50.00
Lin [140]	Nano-ZnO	IC50	*Chlorella sp.*	4,900.00	288	1	10	490.00
Ji et al. [103]	Nano-ZnO	NOEC	*Chlorella sp.*	5,000.00	144	1	1	5,000.00
Fabrega, et.al. [141]	Nano-ZnO	LOEC	*Corophium volutator*	200.00	2400	1	2	100.00
Zhu et al. [108]	Nano-ZnO	LC50	*Danio rerio, Zebrafish*	1,800.00	96	10	10	18.00
Yu [142]	Nano-ZnO	LC50	*Danio rerio, Zebrafish*	3,969.00	96	10	10	39.69
Xiong et al. [105]	Nano-ZnO	LC50	*Danio rerio, Zebrafish*	4,920.00	96	10	10	49.20
Zhao et al. [143]	Nano-ZnO	NOEC	*Daphnia magna, crustacea*	0.80	504	1	1	0.80
Zhu et al. [10]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	622.00	48	10	10	6.22
Wiench et al. [116]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	1,000.00	48	10	10	10.00
Lopes, et.al. [144]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	125.00	504	1	10	12.50
Blinova et al. [145]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	1,700.00	48	10	10	17.00
Naddafi, et.al. [146]	Nano-ZnO	LC50	*Daphnia magna, crustacea*	2,100.00	48	10	10	21.00
Blinova et al. [145]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	2,600.00	48	10	10	26.00
Blinova et al. [145]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	2,800.00	48	10	10	28.00

Heinlaan et al. [117]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	3,200.00	48	10	10	32.00
Blinova et al. [145]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	3,300.00	48	10	10	33.00
Blinova et al. [145]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	3,400.00	48	10	10	34.00
Blinova et al. [145]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	3,500.00	48	10	10	35.00
Heinlaan et al. [117]	Nano-ZnO	NOEC	*Daphnia magna, crustacea*	500.00	48	10	1	50.00
Blinova et al. [145]	Nano-ZnO	EC50	*Daphnia magna, crustacea*	9,000.00	48	10	10	90.00
Poynton et al. [147]	Nano-ZnO	LC10	*Daphnia magna, crustacea*	3,700.00	24	10	2	185.00
Dasari, et.al. [121]	Nano-ZnO	LC50	*Escherichia coli*	48.00	0.5	10	10	0.48
Emami-Karvani, et.al. [148]	Nano-ZnO	MIC	*Escherichia coli*	1,000.00	24	10	2	50.00
Li et al. [136]	Nano-ZnO	IC50	*Escherichia coli*	17,000.00	12	10	10	170.00
Hu et al. [122]	Nano-ZnO	LD50	*Escherichia coli*	21,100.00	2	10	10	211.00
Li et al. [136]	Nano-ZnO	IC50	*Escherichia coli*	34,000.00	12	10	10	340.00
Pokhrel[73]	Nano-ZnO	EC50	*Escherichia coli*	57,700.00	5	10	10	577.00
Ivask, et.al. [29]	Nano-ZnO	EC50	*Escherichia coli*	67,200.00	2	10	10	672.00
Adams et al. [93]	Nano-ZnO	EC50	*Escherichia coli*	1,240,000.00	14-20	10	10	12,400.00
Poynton et al. [149]	Nano-ZnO	LC50	*Hyalella azteca, amphipod*	78.50	96	10	10	0.79
Miller et al. [150]	Nano-ZnO	NOEC	*Isochrysis galbana*	500.00	96	1	1	500.00
Lin [151]	Nano-ZnO	IC50	*Lolium perenne (ryegrass)*	20,000.00	120	10	10	200.00
Lin [152]	Nano-ZnO	IC50	*Lolium perenne (ryegrass)*	51,000.00	288	10	10	510.00
Li et al. [127]	Nano-ZnO	LC50	*Paramecium multi-micronucleatum*	573,800.00	48	1	10	57,380.00
Franklin et al. [153]	Nano-ZnO	IC50	*Pseudokirchneriella subcapitata*	49.00	72	1	10	4.90
Aruoja et al. [130]	Nano-ZnO	NOEC	*Pseudokirchneriella subcapitata*	17.00	72	1	1	17.00
Lee [154]	Nano-ZnO	NOEC	*Pseudokirchneriella subcapitata*	50.00	72	1	1	50.00
Lin [151]	Nano-ZnO	IC50	*Raphanus sativus, radish*	50,000.00	120	10	10	500.00
Kasemets [133]	Nano-ZnO	EC50	*Saccharomyces cerevisiae*	143,868.00	24	10	10	1,438.68
Emami-Karvani, et.al. [148]	Nano-ZnO	MIC	*Staphylococcus aureus*	500.00	24	10	2	25.00
Jones et al. [137]	Nano-ZnO	MIC	*Staphylococcus aureus*	80,000.00	24	10	2	4,000.00

Jones et al. [137]	Nano-ZnO	MIC	*Staphylococcus aureus*	1,200,000.00	24	10	2	60,000.00
Mortimer et al. [155]	Nano-ZnO	EC50	*Tetrahymena thermophila, protozoa*	4,300.00	4	10	10	43.00
Mortimer et al. [155]	Nano-ZnO	EC50	*Tetrahymena thermophila, protozoa*	6,800.00	24	10	10	68.00
Blinova et al. [145]	Nano-ZnO	EC50	*Tetrahymena thermophila, protozoa*	9,400.00	24	10	10	94.00
Blinova et al. [145]	Nano-ZnO	EC50	*Tetrahymena thermophila, protozoa*	12,400.00	24	10	10	124.00
Blinova et al. [71]	Nano-ZnO	EC50	*Tetrahymena thermophila, protozoa*	26,500.00	24	10	10	265.00
Miller et al. [150]	Nano-ZnO	NOEC	*Thalassiosira pseudonana*	100.00	96	1	1	100.00
Wong [156]	Nano-ZnO	LC50	*Thalassiosira pseudonana*	3,280.00	96	1	10	328.00
Jarvis [157]	Nano-ZnO	NOEC	*Thalassiosira weissflogii*	10.00	72	1	1	10.00
Blinova et al. [145]	Nano-ZnO	LC50	*Thamnocephalus platyurus*	140.00	24	10	10	1.40
Heinlaan et al. [117]	Nano-ZnO	NOEC	*Thamnocephalus platyurus*	30.00	24	10	1	3.00
Blinova et al. [145]	Nano-ZnO	LC50	*Thamnocephalus platyurus*	1,100.00	24	10	10	11.00
Blinova et al. [145]	Nano-ZnO	LC50	*Thamnocephalus platyurus*	1,400.00	24	10	10	14.00
Blinova et al. [145]	Nano-ZnO	LC50	*Thamnocephalus platyurus*	1,500.00	24	10	10	15.00
Blinova et al. [145]	Nano-ZnO	LC50	*Thamnocephalus platyurus*	3,600.00	24	10	10	36.00
Blinova et al. [145]	Nano-ZnO	LC50	*Thamnocephalus platyurus*	5,300.00	24	10	10	53.00
Blinova et al. [145]	Nano-ZnO	LC50	*Thamnocephalus platyurus*	6,000.00	24	10	10	60.00
Nations, et.al. [135]	Nano-ZnO	EC10	*Xenopus laevis, amphibian*	1,300.00	96	10	2	65.00

Table S2: Data for soil toxicity for nano-Ag, nano-TiO_2, nano-ZnO, CNT and Fullerenes.

Author	ENM	Dose descriptor	Test organism	Concentration (µg/kg)	Exposure time (h)	AF time	AF no-effect	Species sensitivity (µg/kg)
De La Torre-Roche [158]	CNT	HONEC	*Curcubita pepo, zucchini*	5,000,000.00	672	1	1	5,000,000.00
Scott-Fordsmand et al. [159]	CNT	EC50	*Eisenia veneta, earthworm*	176,000.00	672	1	10	17,600.00
De La Torre-Roche [158]	CNT	LOEC	*Glycine max, soy bean*	1,000,000.00	672	1	2	500,000.00
Chung et al. [160]	CNT	LOEC	microbial biomass (organic C and N)	500,000.00	480	1	2	250,000.00
Chung, et.al. [160]	CNT	HONEC	soil microbial community	50,000.00	264	1	1	50,000.00
Shrestha, et.al. [161]	CNT	HONEC	*soil microbial community*	1,000,000.00	2160	1	1	1,000,000.00
De La Torre-Roche [158]	CNT	HONEC	*Solanum lycopersicu, tomato*	5,000,000.00	672	1	1	5,000,000.00
De La Torre-Roche [158]	CNT	LOEC	*Zea may, maize*	500,000.00	672	1	2	250,000.00
De La Torre-Roche [158]	Fullerenes	HONEC	*Curcubita pepo, zucchini*	5,000,000.00	672	1	1	5,000,000.00
Scott-Fordsmand et al. [159]	Fullerenes	HONEC	*Eisenia veneta, earthworm*	1,000,000.00	672	1	1	1,000,000.00
Johansen et al. [162]	Fullerenes	EC10	fast growing soil microbacteria	50,000.00	3	10	2	2,500.00
De La Torre-Roche [158]	Fullerenes	LOEC	*Glycine max, soy bean*	500,000.00	672	1	2	250,000.00
Van der Ploeg et al. [163]	Fullerenes	NOEC	*Lumbriculus rubellus (earthworm)*	15,400.00	7824	1	1	15,400.00
Johansen et al. [162]	Fullerenes	EC40	slow growing soil microbacteria	50,000.00	336	1	10	5,000.00
Tong et al. [164]	Fullerenes	HONEC	soil microbial community	1,000,000.00	720	1	1	1,000,000.00
De La Torre-Roche [158]	Fullerenes	HONEC	*Solanum lycopersicu, tomato*	5,000,000.00	672	1	1	5,000,000.00
De La Torre-Roche [158]	Fullerenes	LOEC	*Zea may, maize*	500,000.00	672	1	2	250,000.00

Schlich [165]	Nano-Ag	NOEC	*Eisenia fetida, earthworm*	60,000.00	1344	1	1	60,000.00
Shoults-Wilson et al. [166]	Nano-Ag	NOEC	*Eisenia fetida, earthworm*	79,450.00	672	1	1	79,450.00
Shoults-Wilson et al. [166]	Nano-Ag	NOEC	*Eisenia fetida, earthworm*	84,150.00	672	1	1	84,150.00
Gomes, et.al. [167]	Nano-Ag	NOEC	*Enchytraeus albidus, Oligochaete*	100,000.00	1008	1	1	100,000.00
Lee [168]	Nano-Ag	NOEC	*Phaseolus radiatus*	100,000.00	120	10	1	10,000.00
Lee [168]	Nano-Ag	NOEC	*Sorghum bicolor*	2,000,000.00	120	10	1	200,000.00
Heckmann [169]	Nano-TiO2	EC50	*Eisenia fetida, earthworm*	1,000,000.00	672	1	10	100,000.00
Hu, et.al. [170]	Nano-TiO2	LOEC	*Eisenia fetida, earthworm*	5,000,000.00	168	10	2	250,000.00
Canas, et.al. [171]	Nano-TiO2	HONEC	*Eisenia fetida, earthworm*	10,000,000.00	336	10	1	1,000,000.00
Nogueira, et.al. [172]	Nano-TiO2	LOEC	*soil microbial community*	5,000,000.00	720	1	2	2,500,000.00
Hu, et.al. [170]	Nano-ZnO	LOEC	*Eisenia fetida, earthworm*	1,000,000.00	168	10	2	50,000.00
Heggelund [173]	Nano-ZnO	EC50	*Eisenia fetida, earthworm*	901,000.00	672	1	10	90,100.00
Heggelund [173]	Nano-ZnO	EC50	*Eisenia fetida, earthworm*	918,600.00	672	1	10	91,860.00
Heggelund [173]	Nano-ZnO	EC50	*Eisenia fetida, earthworm*	2,874,000.00	672	1	10	287,400.00
Canas, et.al. [171]	Nano-ZnO	HONEC	*Eisenia fetida, earthworm*	10,000,000.00	336	10	1	1,000,000.00
Hooper et al. [174]	Nano-ZnO	EC50	*Eisenia veneta, earthworm*	750,000.00	504	10	10	7,500.00
Waalewijn-Kool [175]	Nano-ZnO	EC50	*Folsomia candida, springtail*	553,000.00	672	1	10	55,300.00
Waalewijn-Kool [176]	Nano-ZnO	EC50	*Folsomia candida, springtail*	749,000.00	2160	1	10	74,900.00
Waalewijn-Kool [176]	Nano-ZnO	EC50	*Folsomia candida, springtail*	873,000.00	672	1	10	87,300.00
Waalewijn-Kool [175]	Nano-ZnO	EC50	*Folsomia candida, springtail*	1,481,000.00	672	1	10	148,100.00
Waalewijn-Kool [176]	Nano-ZnO	EC50	*Folsomia candida, springtail*	1,817,000.00	8760	1	10	181,700.00

Waalewijn-Kool[176]	Nano-ZnO	EC50	*Folsomia candida, springtail*	1,964,000.00	672	1	10	196,400.00
Waalewijn-Kool [176]	Nano-ZnO	EC50	*Folsomia candida, springtail*	2,847,000.00	2160	1	10	284,700.00
Waalewijn-Kool [175]	Nano-ZnO	EC50	*Folsomia candida, springtail*	3,233,000.00	672	1	10	323,300.00
Waalewijn-Kool [176]	Nano-ZnO	EC50	*Folsomia candida, springtail*	5,855,000.00	8760	1	10	585,500.00
Kool [177]	Nano-ZnO	EC10	*Folsomia candida, springtail*	1,678,000.00	672	1	2	839,000.00
Manzo et al. [178]	Nano-ZnO	EC25	*Lepidium sativum (garden cress)*	286,000.00	72	10	10	2,860.00
Tourinho, et.al. [179]	Nano-ZnO	EC50	*Porcellionides pruinosus*	119,000.00	336	10	10	1,190.00
Rousk [180]	Nano-ZnO	EC50	soil bacteria	5,184,000.00	5	10	10	51,840.00
Rousk [180]	Nano-ZnO	EC50	soil bacteria	12,025,000.00	5	10	10	120,250.00

Table S3: Data for sediment toxicity for nano-Ag, nano-TiO_2, nano-ZnO, CNT and Fullerenes.

Author	ENM	Dose descriptor	Test organism	Concentration (µg/kg)	Exposure time (h)	AF time	AF no-effect	Species sensitivity (µg/kg)
Petersen, et.al. [181]	CNT	HONEC	*Lumbriculus variegatus, earthworm*	30,000.00	672	1	1	30,000.00
Petersen, et.al. [181]	CNT	HONEC	*Lumbriculus variegatus*	370,000.00	672	1	1	370,000.00
Kennedy et al. [5]	CNT	LC50	*Hyalella azteca, amphipod*	264,000,000.00	240	10	10	2,640,000.00
Kennedy et al. [182]	CNT	HONEC	*Hyalella azteca, amphipod*	99,000,000.00	240	10	1	9,900,000.00
Pakarinen [183]	Fullerenes	HONEC	*Lumbriculus variegatus*	50,000.00	672	1	1	50,000.00
Musee, et. Al. [184]	Nano-TiO2	HONEC	*Physa acuta, snail*	500,000.00	672	1	1	500,000.00

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