Supplementary Information

Analysis of the Landfill Leachate Treatment System Using Arima Models: A Case Study in a Megacity

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Table S1. Pearson's correlations between chemical characteristics of untreated leachate during the study period.

	BOD_5	**COD**	**NH_4**	**Cd**	**Zn**	**Hg**	**As**	**Cu**
BOD_5	1.00							
COD	**0.996**	1.00						
NH_4	**-0.449**	**-0.447**	1.00					
Cd	0.041	0.056	-0.008	1.00				
Zn	**0.516**	**0.519**	**-0.195**	0.146	1.00			
Hg	0.085	0.083	-0.065	**0.710**	-0.101	1.00		
As	**-0.178**	**-0.192**	0.124	0.091	-0.088	0.025	1.00	
Cu	0.014	0.017	-0.005	**0.842**	**-0.306**	**0.951**	0.066	1.00
Fe	-0.051	-0.050	0.025	-0.031	-0.024	-0.027	**0.223**	-0.009
Pb	0.089	0.094	-0.022	**0.790**	**0.337**	**0.940**	0.024	**0.987**
Co	0.044	0.046	0.113	**0.719**	**0.362**	**0.712**	**0.163**	**0.763**
Cr	-0.035	-0.032	0.031	**-0.237**	0.148	-0.089	0.132	**-0.171**
Ni	**0.413**	**0.423**	-0.007	**0.408**	**0.421**	0.030	-0.104	0.017
pH	**-0.405**	**-0.400**	**0.169**	**0.164**	**-0.403**	0.107	0.087	0.026
R	-0.132	-0.141	0.084	-0.014	-0.088	-0.055	0.008	-0.016
T	**-0.709**	**-0.709**	**0.277**	0.010	**-0.526**	-0.004	0.071	0.039
	Fe	**Pb**	**Co**	**Cr**	**Ni**	**pH**	**R**	**T**
Fe	1.00							
Pb	-0.003	1.00						
Co	0.020	**0.766**	1.00					
Cr	-0.005	**-0.183**	-0.013	1.00				
Ni	-0.104	0.111	0.110	0.037	1.00			
pH	0.009	-0.091	-0.038	0.079	-0.131	1.00		
R	**0.359**	-0.026	-0.058	-0.082	-0.067	**0.216**	1.00	
T	-0.039	-0.033	-0.114	-0.098	**-0.238**	**0.208**	0.004	1.00

Note. R = Rainfall, and T = Temperature. Significant correlations in bold.

Table S2. Parameter estimates for the ARIMA model terms selected for the variables considered in the untreated leachate.

				Estimate	SE	t	Sig.
Monthly MSW	No Transformation	AR	Lag 1	-.515	.085	-6.081	.000
			Lag 2	-.246	.085	-2.908	.004
		Difference		1			
		MA	Lag 10	.296	.088	3.353	.001
		AR, Seasonal	Lag 1	-.394	.082	-4.793	.000
		Seasonal Difference		1			
Daily MSW	No Transformation	AR	Lag 1	-.528	.084	-6.291	.000
			Lag 2	-.255	.084	-3.026	.003
		Difference		1			
		MA	Lag 10	.295	.089	3.326	.001
		AR, Seasonal	Lag 1	-.391	.082	-4.748	.000
		Seasonal Difference		1			
BOD_5	No Transformation	Difference		1			
		MA	Lag 1	.272	.078	3.503	.001
COD	No Transformation	Difference		1			
		MA	Lag 1	.288	.077	3.736	.000
NH_4	No Transformation	Constant		2,724,651	67.900	40.128	.000
		AR	Lag 1	.958	.065	14.685	.000
		MA	Lag 1	.403	.114	3.546	.001
			Lag 3	.428	.098	4.369	.000
		AR, Seasonal	Lag 1	-.893	.193	-4.639	.000
		MA, Seasonal	Lag 1	-.825	.246	-3.358	.001
Cd	Natural Log	Constant		-4,601	.177	-25.985	.000
		AR	Lag 1	.778	.087	8.968	.000
		MA	Lag 1	.334	.125	2.662	.009
			Lag 11	-.275	.081	-3.405	.001
		MA, Seasonal	Lag 1	-.187	.094	-1.993	.048
Zn	Natural Log	AR	Lag 1	.278	.119	2.346	.020
		Difference		1			
		MA	Lag 1	.805	.077	10.435	.000
Hg	Natural Log	Constant		-5,079	.105	-48.572	.000
		MA	Lag 1	-.166	.080	-2.082	.039
As	Natural Log	Constant		-4,696	.367	-12.801	.000
		AR	Lag 1	.531	.080	6.668	.000
			Lag 2	.222	.080	2.783	.006
Cu	Natural Log	Difference		1			
		MA	Lag 1	.849	.050	17.065	.000

Fe	Natural Log	Constant		2,990	.232	12.862	.000
		AR	Lag 1	.913	.055	16.494	.000
		MA	Lag 1	.690	.098	7.018	.000
Pb	Natural Log	Constant		-1,858	.153	-12.107	.000
		AR	Lag 1	.793	.081	9.742	.000
		MA	Lag 1	.362	.125	2.897	.004
Co	Natural Log	Constant		-2,444	.047	-52.409	.000
		MA	Lag 1	-.255	.076	-3.345	.001
			Lag 2	-.257	.083	-3.103	.002
Cr	Square Root	Constant		,817	.036	22.673	.000
		AR	Lag 1	.611	.064	9.514	.000
Ni	Square Root	Constant		,689	.018	37.434	.000
		AR	Lag 1	.551	.067	8.221	.000
pH	No Transformation	Constant		8,288	.054	152.188	.000
		AR	Lag 1	.670	.060	11.187	.000

Table S3. Pearson´s correlations between chemical characteristics of treated leachate during the study period.

	BOD_5	**COD**	**NH_4**	**Cd**	**Zn**	**Hg**	**As**	**Cu**
BOD_5	1.00							
COD	**0.865**	1.00						
NH_4	**0.349**	**0.349**	1.00					
Cd	**0.447**	**0.389**	0.076	1.00				
Zn	**0.304**	**0.304**	**0.438**	**0.483**	1.00			
Hg	**0.232**	0.151	-0.044	**0.326**	0.084	1.00		
As	0.153	-0.006	0.217	**0.252**	0.085	**0.286**	1.00	
Cu	0.040	**-0.383**	**0.252**	0.081	0.023	**0.235**	**0.497**	1.00
Fe	**0.426**	**0.279**	0.150	**0.403**	**0.462**	**0.318**	**0.463**	**0.431**
Pb	**0.365**	**0.355**	**0.341**	**0.815**	**0.442**	**0.300**	**0.201**	-0.009
Co	-0.033	**-0.220**	-0.096	**0.335**	0.134	**0.264**	**0.424**	**0.480**
Cr	**0.220**	-0.031	0.054	0.136	**0.350**	0.109	**0.257**	**0.542**
Ni	**0.388**	**0.356**	**0.312**	**0.545**	**0.342**	**0.302**	**0.400**	0.114
pH	0.060	0.046	**0.268**	**0.159**	-0.007	0.050	**0.237**	0.038
R	**0.177**	**0.166**	0.120	**0.190**	**0.233**	0.079	0.059	0.006
T	0.127	**-0.209**	-0.112	0.129	-0.083	**0.421**	**0.470**	**0.648**
	Fe	**Pb**	**Co**	**Cr**	**Ni**	**pH**	**R**	**T**
Fe	1.00							
Pb	**0.263**	1.00						
Co	**0.258**	**0.350**	1.00					
Cr	**0.629**	0.081	**0.240**	1.00				
Ni	**0.511**	**0.560**	**0.310**	**0.308**	1.00			
pH	0.101	0.070	-0.091	0.024	**0.257**	1.00		
R	0.112	**0.194**	0.073	0.096	0.023	-0.089	1.00	
T	**0.378**	0.146	**0.473**	**0.427**	**0.232**	0.031	0.004	1.00

Note. R = Rainfall, and T = Temperature. Significant correlations in bold.

Table S4. Parameter estimates for the ARIMA model terms selected for the variables considered in the treated leachate.

				Estimate	SE	t	Sig.
Monthly MSW	No Transformation	AR	Lag 1	-.515	.085	-6.081	.000
			Lag 2	-.246	.085	-2.908	.004
		Difference		1			
		MA	Lag 10	.296	.088	3.353	.001
		AR, Seasonal	Lag 1	-.394	.082	-4.793	.000
		Seasonal Difference		1			
Daily MSW	No Transformation	AR	Lag 1	-.528	.084	-6.291	.000
			Lag 2	-.255	.084	-3.026	.003
		Difference		1			
		MA	Lag 10	.295	.089	3.326	.001
		AR, Seasonal	Lag 1	-.391	.082	-4.748	.000
		Seasonal Difference		1			
BOD_5	Natural Log	Constant		5.176	.215	24.090	.000
		MA	Lag 1	-.876	.077	-11.437	.000
			Lag 2	-.643	.095	-6.763	.000
			Lag 3	-.541	.095	-5.669	.000
			Lag 4	-.349	.077	-4.530	.000
COD	Square Root	Constant		44.805	6.589	6.800	.000
		AR	Lag 1	.915	.038	23.940	.000
		MA	Lag 2	.202	.087	2.310	.022
		MA, Seasonal	Lag 1	-.194	.082	-2.360	.020
NH_4	No Transformation	Constant		-21.380	38.304	-.558	.047
		Difference		1			
Cd	Natural Log	AR	Lag 1	-.415	.073	-5.662	.000
		Difference		1			
Zn	Natural Log	Constant		-1.023	.060	-16.950	.000
		MA	Lag 1	-.483	.070	-6.882	.000
			Lag 2	-.493	.071	-6.912	.000
Hg	Natural Log	Difference		1			
		MA	Lag 1	.765	.054	14.275	.000
As	Natural Log	Difference		1			
		MA	Lag 1	.469	.077	6.106	.000
Cu	No Transformation	Difference		1			
		MA	Lag 1	.543	.070	7.733	.000
Fe	Natural Log	Constant		1.821	.168	10.825	.000
		AR	Lag 1	.857	.059	14.617	.000

		MA	Lag 1	.350	.106	3.300	.001
Pb	Square Root	Difference		1			
		MA	Lag 1	.695	.058	11.901	.000
Co	Natural Log	Difference		1			
		MA	Lag 1	.442	.073	6.047	.000
		AR, Seasonal	Lag 1	.985	.289	3.407	.001
		MA, Seasonal	Lag 1	.958	.458	2.095	.038
Cr	Natural Log	Constant		-.884	.200	-4.419	.000
		AR	Lag 1	.959	.039	24.859	.000
		MA	Lag 1	.373	.091	4.098	.000
			Lag 2	.342	.088	3.912	.000
Ni	No Transformation	Constant		.392	.028	14.108	.000
		AR	Lag 1	.865	.062	13.994	.000
		MA	Lag 1	.490	.109	4.489	.000
pH	No Transformation	Constant		8.210	.095	86.083	.000
		AR	Lag 1	.746	.054	13.921	.000

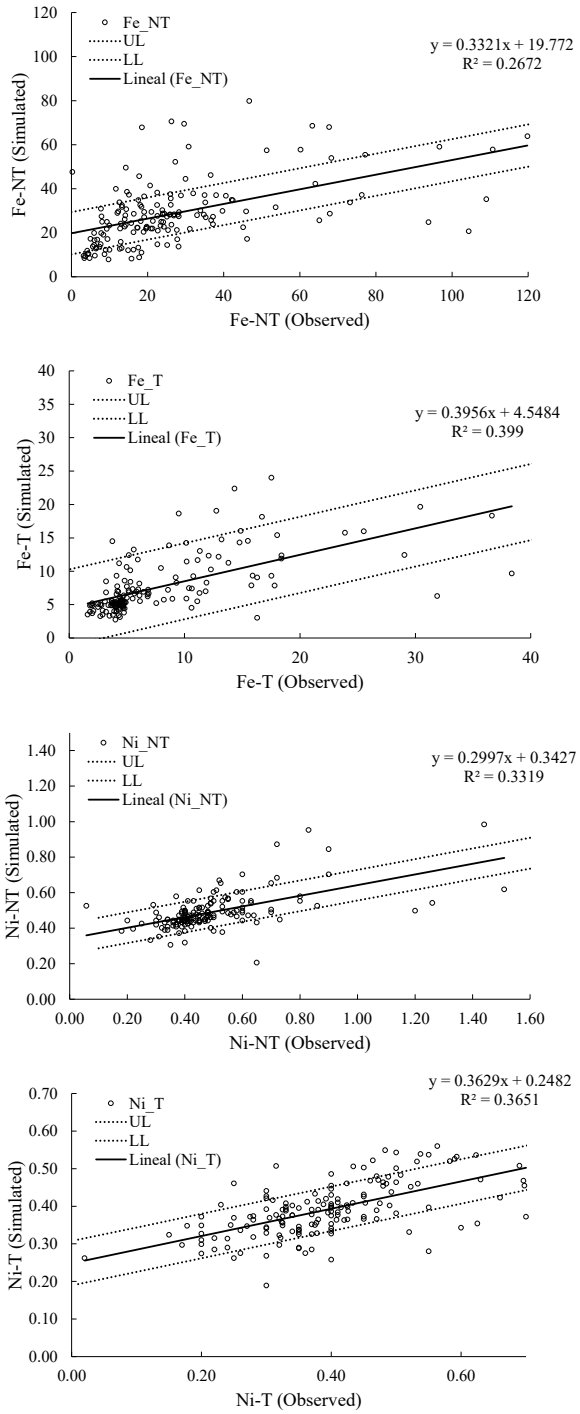

Figure S1. Scatter plots for the observed and simulated (ARIMA) values of Fe and Ni concentrations in untreated and treated leachate during the study period.