# Supplemental material:

Environmental Science and Pollution Research

# Assessing risk to human health for heavy metal contamination from public point utility through ground dust: a case study in Nantong, China

Yanping Wang1, Peng Qian1\*, Dongming Li2, Haifeng Chen3, Xiangqian Zhou4

1 School of Geographical Science, Nantong University, 9 Seyuan Road, 226019 Nantong, China

2 Nantong Water Conservation Project Management Office of Tonglv Canal River, 397 West Waihuan Road, 226005 Nantong, China

3 Nantong Branch of Jiangsu Hydrology and Water Resources Survey Bureau, 31 Yaogang Road, 226006 Nantong, China

4 Department of Aquatic Ecosystems Analysis and Management, Helmholtz Centre for Environmental Research (UFZ), Brückstraße 3a, 39114 Magdeburg, Germany

\*Corresponding email: dapeng\_96@sina.com



## **Fig. S1 Number of** private cars and coal consumption in Nantong City from 2010 to 2014 (Nantong Statistic Bureau, 2010-2014)

## Table S1. Exposure factors for metal dosages

| Factor | Definition | Unit | Value (adult) | Reference |
| --- | --- | --- | --- | --- |
| *C* | Heavy metal concentration | mg kg-1 |  | This study |
| *IngR* | Ingestion rate of soil | mg d-1 | 100.00 | US EPA (2001); US EPA (2001) |
| *EF* | Exposure frequency | Days year-1 | 350.00 (245) | Environmental site assessment guideline of the People’s Republic of China (2009) |
| *ED* | Exposure duration | Years | 4 |  |
| *BW* | Average body weight | kg | 55.90 | Environmental site assessment guideline of the People’s Republic of China (2009) |
| *AT* | Average time (life span) | Days | 365.00×ED | US EPA (1989) |
| *CF* | Conversion factor | kg mg-1 | 1.00×10-6 | Wei et al. (2015) |
| *InhR* | Inhalation rate | m3 kg-1 | 12.80 | Wei et al. (2015) |
| *PEF* | Particle emission factor | m3 kg-1 | 1.36×109 | US EPA (2001) |
| *SA* | Surface area of the skin that contacts the dust | cm2 | 4350.00 | Environmental site assessment guideline of the People’s Republic of China (2009) |
| *AF* | Skin adherence factor | mg cm-2 | 0.70 | US EPA (2001) |
| *ABF* | Dermal absorption factor | Dimensionless | 0.001 | Wei et al. (2015) |

## Table S2. Summary of the reference dosages (RfD) and cancer slope factors of the trace metals

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Contamination of potential concern | Ingestion RfDa  (mg kg-1-day) | Inhalation RfDb  (mg kg-1-day) | Dermal RfDc  (mg kg-1-day) | Ingestion SFd  (kg-day mg-1) | Inhalation SFa  (kg-day mg-1) | Dermal SFe  (kg-day mg-1) |
| Cr | 3.00E-03 | 2.86E-05 | 6.00E-05 | 5.01E-01 | 4.20E+01 | 2.00E+01 |
| Cu | 4.00E-02 | 4.00E-02\* | 1.20E-02 | NA | NA | NA |
| Mn | 4.60E-02 | 1.43E-05 | 1.84E-03 | NA | NA | NA |
| Ni | 2.00E-02 | 2.00E-02\* | 5.40E-03 | 1.70E+00 | 8.40E-01 | 4.25E+01 |
| Pb | 1.40E-03 | 1.40E-03\* | 5.20E-04 | NA | NA | NA |
| Zn | 3.00E-01 | 3.00E-01\* | 1.00E-02 | NA | NA | NA |

**Note: In the table, NA indicates not applicable; NF indicates not found;**

**\* indicates inhalation RfD was replaced by ingestion RfD;**

**a. US EPA (1999); b. U.S. Department of Energy (2000); c. Environmental site assessment guideline of the People’s Republic of China (2009); d. US EPA (2011); e. Duan et al. (2011).**

## Table S3. Spearman Correlation Matrix between the heavy metals and selected magnetic properties

|  | Cr | Cu | Mn | Ni | Pb | Zn |  | SIRM | χARM | HIRM |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Autumn (**n=17**)** |  |  |  |  |  |  |  |  |  |  |
| Cr | 1 |  |  |  |  |  |  |  |  |  |
| Cu | 0.33 | 1 |  |  |  |  |  |  |  |  |
| Mn | 0.69\* | **0.64\*\*** | 1 |  |  |  |  |  |  |  |
| Ni | **0.65\*\*** | 0.59\* | 0.53\* | 1 |  |  |  |  |  |  |
| Pb | 0.60\* | 0.53\* | 0.48 | **0.63\*\*** | 1 |  |  |  |  |  |
| Zn | 0.58\* | **0.69\*\*** | 0.51\* | **0.70\*\*** | **0.75\*\*** | 1 |  |  |  |  |
| |  | | --- | |  | | 0.00 | **0.66\*\*** | 0.47 | 0.16 | 0.36 | 0.33 | 1 |  |  |  |
| SIRM | 0.03 | **0.73\*\*** | 0.37 | 0.41 | 0.32 | 0.44 | **0.80\*\*** | 1 |  |  |
| χARM | 0.06 | **0.62\*\*** | 0.44 | 0.40 | 0.33 | 0.26 | **0.89\*\*** | **0.78\*\*** | 1 |  |
| **Winter (**n=6**)** |  |  |  |  |  |  |  |  |  |  |
| Cr | 1 |  |  |  |  |  |  |  |  |  |
| Cu | **0.94\*\*** | 1 |  |  |  |  |  |  |  |  |
| Mn | 0.43 | 0.14 | 1 |  |  |  |  |  |  |  |
| Ni | 0.49 | 0.43 | 0.43 | 1 |  |  |  |  |  |  |
| Pb | **0.94\*\*** | 0.89\* | 0.31 | 0.54 | 1 |  |  |  |  |  |
| Zn | **1.00\*\*** | **0.94\*\*** | 0.43 | 0.49 | **0.94\*\*** | 1 |  |  |  |  |
| |  | | --- | |  | | 0.60 | 0.49 | 0.49 | **0.94\*\*** | 0.71 | 0.60 | 1 |  |  |  |
| SIRM | **0.94\*\*** | 0.83\* | 0.66 | 0.60 | 0.83\* | **0.94\*\*** | 0.66 | 1 |  |  |
| χARM | **0.94\*\*** | 0.83\* | 0.66 | 0.60 | 0.83\* | **0.94\*\*** | 0.66 | **1.00\*\*** | 1 |  |
| **Spring (**n=10**)** |  |  |  |  |  |  |  |  |  |  |
| Cr | 1 |  |  |  |  |  |  |  |  |  |
| Cu | 0.72\* | 1 |  |  |  |  |  |  |  |  |
| Mn | 0.46 | **0.83\*\*** | 1 |  |  |  |  |  |  |  |
| Ni | 0.33 | 0.66\* | **0.83\*\*** | 1 |  |  |  |  |  |  |
| Pb | 0.37 | 0.50 | 0.62 | 0.56 | 1 |  |  |  |  |  |
| Zn | 0.55 | 0.50 | 0.37 | 0.3 | **0.78\*\*** | 1 |  |  |  |  |
| |  | | --- | |  | | 0.29 | 0.55 | 0.73\* | 0.50 | 0.56 | 0.32 | 1 |  |  |  |
| SIRM | 0.41 | 0.61 | **0.83\*\*** | 0.49 | 0.60 | 0.41 | **0.92\*\*** | 1 |  |  |
| χARM | 0.22 | 0.49 | 0.72\* | 0.46 | 0.56 | 0.44 | **0.93\*\*** | **0.94\*\*** | 1 |  |
| **Summer (**n=7**)** |  |  |  |  |  |  |  |  |  |  |
| Cr | 1 |  |  |  |  |  |  |  |  |  |
| Cu | 0.21 | 1 |  |  |  |  |  |  |  |  |
| Mn | 0.71 | 0.18 | 1 |  |  |  |  |  |  |  |
| Ni | 0.54 | 0.86\* | 0.32 | 1 |  |  |  |  |  |  |
| Pb | 0.43 | 0.93\* | 0.18 | **0.96\*\*** | 1 |  |  |  |  |  |
| Zn | 0.29 | 0.93\* | 0.43 | 0.75 | 0.79\* | 1 |  |  |  |  |
| |  | | --- | |  | | 0.64 | -0.07 | 0.25 | 0.25 | 0.21 | -0.21 | 1 |  |  |  |
| SIRM | 0.82\* | 0.18 | 0.54 | 0.50 | 0.43 | 0.11 | **0.93\*\*** | 1 |  |  |
| χARM | 0.71 | 0.14 | 0.25 | 0.54 | 0.46 | -0.04 | **0.93\*\*** | **0.93\*\*** | 1 |  |
| **Whole year (n=40)** |  |  |  |  |  |  |  |  |  |  |
| Cr | 1 |  |  |  |  |  |  |  |  |  |
| Cu | **0.45\*\*** | 1 |  |  |  |  |  |  |  |  |
| Mn | **0.59\*\*** | 0.38\* | 1 |  |  |  |  |  |  |  |
| Ni | **0.44\*\*** | **0.50\*\*** | 0.35\* | 1 |  |  |  |  |  |  |
| Pb | **0.60\*\*** | **0.77\*\*** | **0.53\*\*** | 0.23 | 1 |  |  |  |  |  |
| Zn | **0.48\*\*** | **0.78\*\*** | **0.48\*\*** | 0.23 | **0.81\*\*** | 1 |  |  |  |  |
| |  | | --- | |  | | **0.43\*\*** | 0.29 | **0.61\*\*** | 0.19 | **0.48\*\*** | 0.21 | 1 |  |  |  |
| SIRM | **0.44\*\*** | 0.33\* | **0.59\*\*** | 0.20 | **0.47\*\*** | 0.33\* | **0.90\*\*** | 1 |  |  |
| χARM | 0.31 | 0.30 | **0.66\*\*** | 0.16 | **0.53\*\*** | 0.34\* | **0.71\*\*** | **0.74\*\*** | 1 |  |

**Note: \* indicates correlation is significant at the 0.05 level (2-tailed);**

**\*\* indicates significant correlation at the 0.01 level (2-tailed)**