

Supplementary material for

Air pollution and human health: Investigating the moderating effect of built environment.

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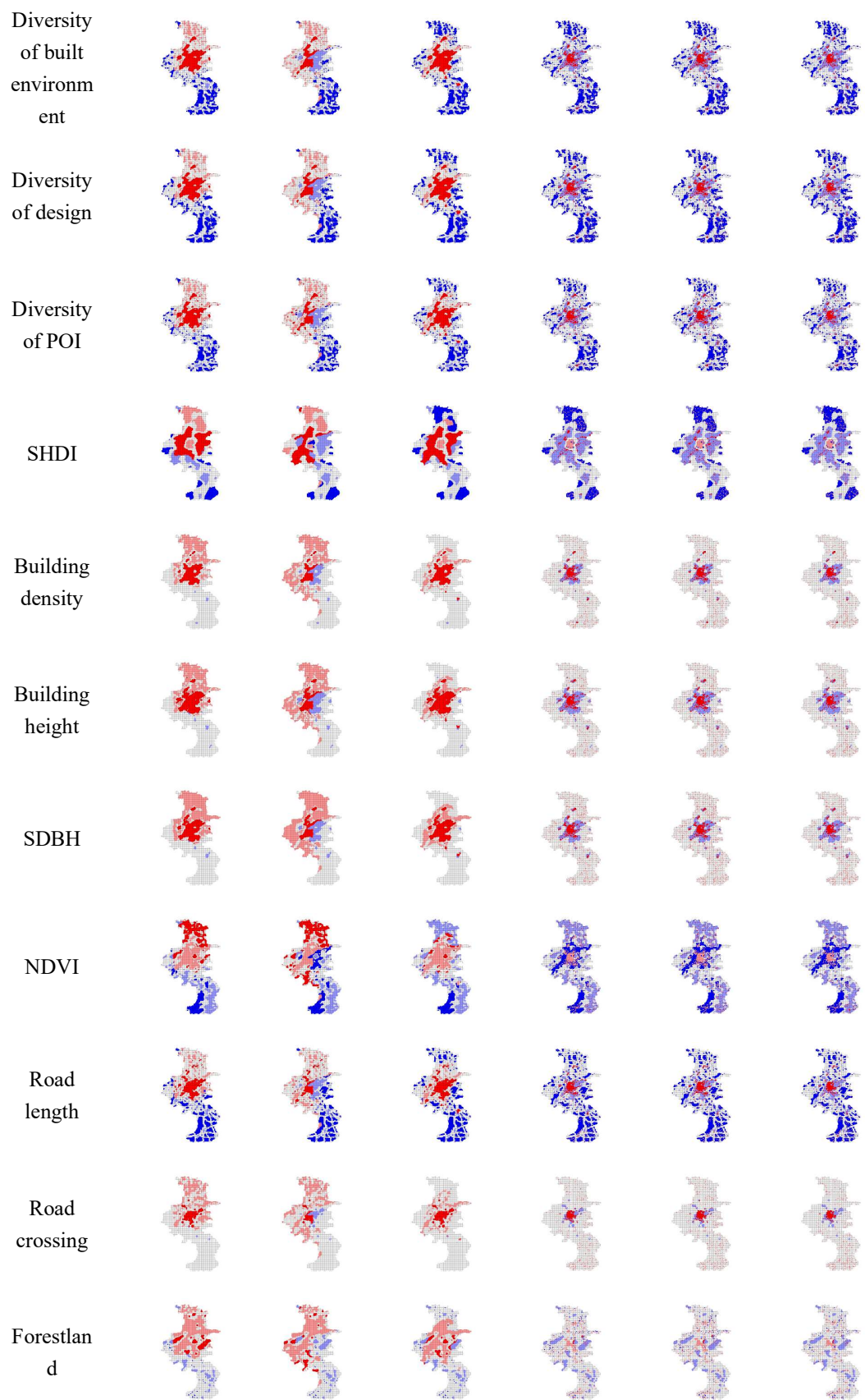
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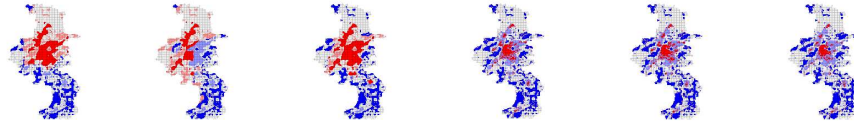
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Construct
ion land



Water
area



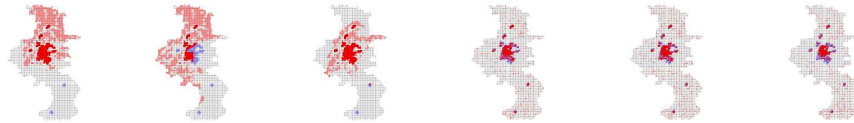
Hygiene
facility



Governm
ent
agency



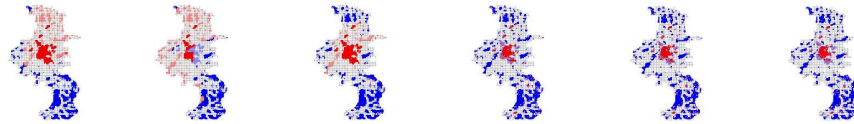
Residenti
al
communi
ty



Industrial
park



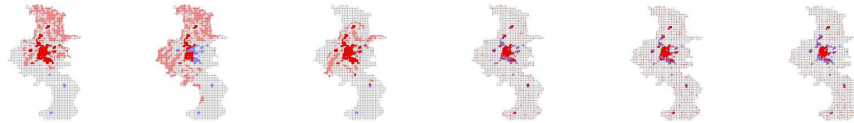
Traffic
facilities



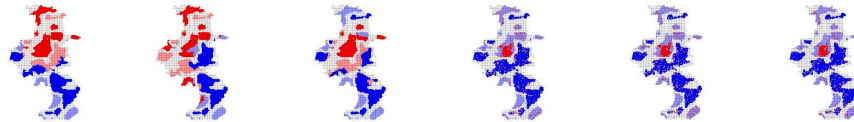
Gas
station



Catering
facility



AI



ED



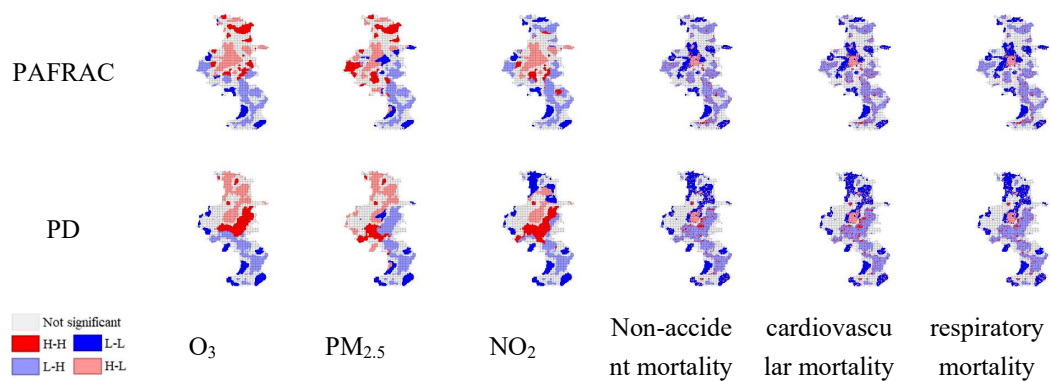
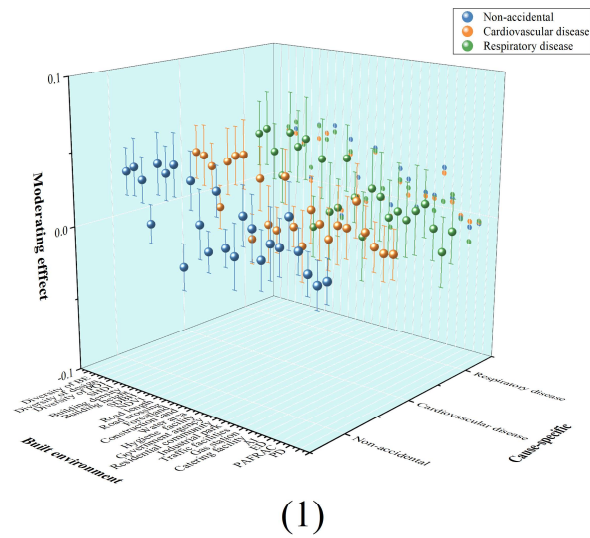
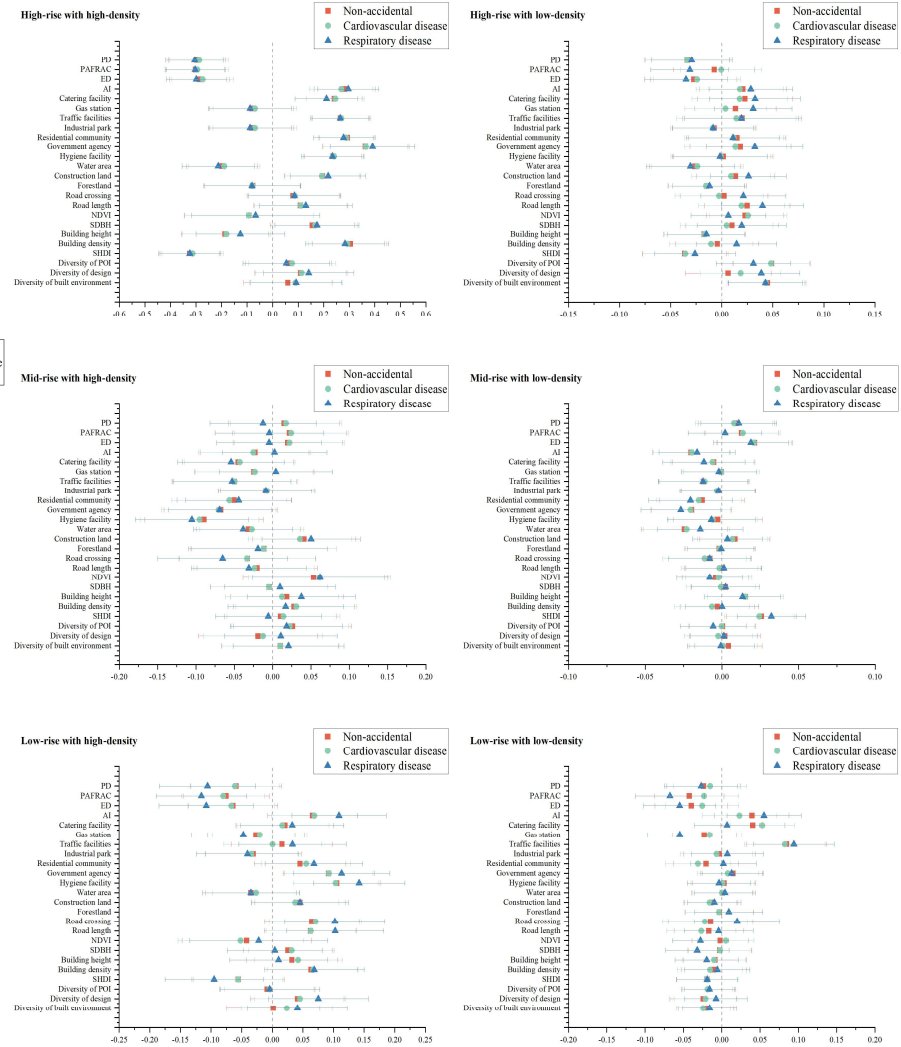


Figure S1. Spatial correlation of air pollution (O₃, PM_{2.5} and NO₂) and mortality with built environment respectively.

Moderating effect of built environment in the relationship between O_3 and mortality

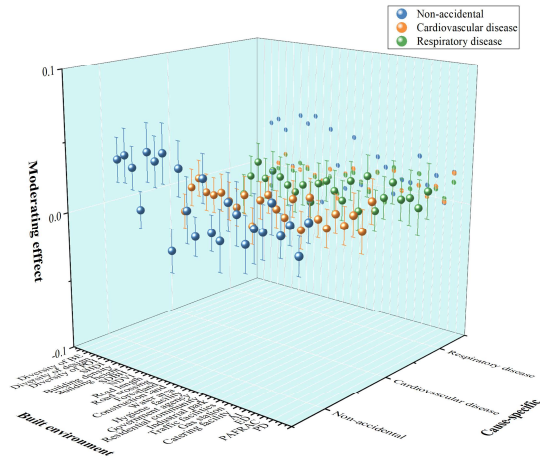


(a)



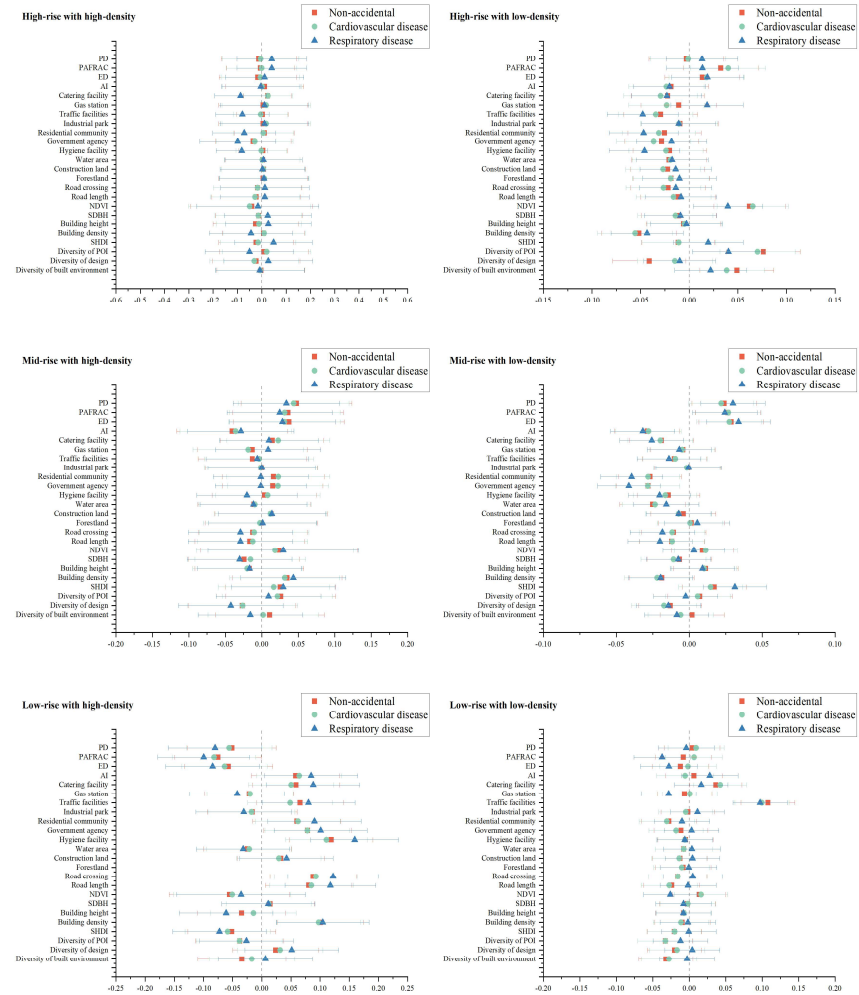
(2)

Moderating effect of built environment in the relationship between PM_{2.5} and mortality



(1)

(b)



(2)

Moderating effect of built environment in the relationship between NO₂ and mortality

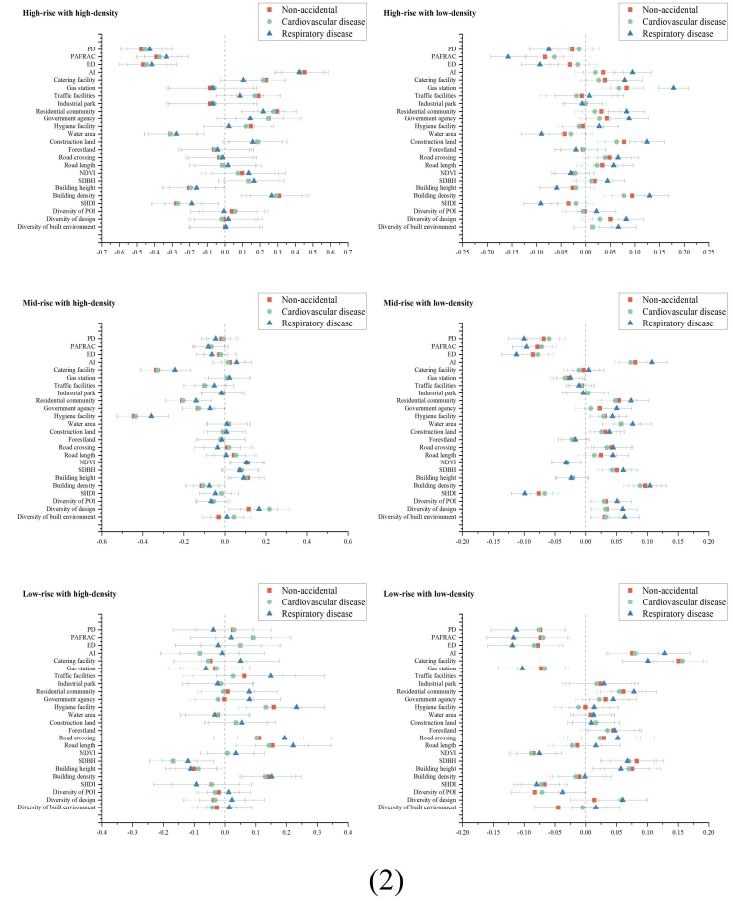
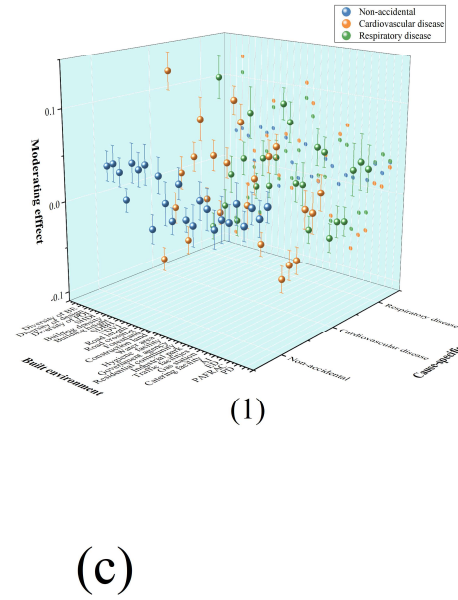


Figure S2. Moderating effect of built environment in the relationship between air pollution and mortality in (1) unclassified area and (2) areas classified by building density and height. (a) Moderating effect of built environment in the relationship between O₃ and mortality; (b) Moderating effect of built

environment in the relationship between PM_{2.5} and mortality; (c) Moderating effect of built environment in the relationship between NO₂ and mortality.

Table S1. The percentage of H-H type grids corresponding to Figure S1.

| | O3 | PM2.5 | NO2 | Non-accident mortality | Cardiovascular mortality | Respiratory mortality |
|--------------------------------|--------|--------|--------|------------------------|--------------------------|-----------------------|
| Diversity of built environment | 14.85% | 7.52% | 15.63% | 6.42% | 6.60% | 5.06% |
| Diversity of design | 13.98% | 7.03% | 14.69% | 5.94% | 6.02% | 4.73% |
| Diversity of POI | 14.20% | 7.84% | 14.84% | 6.81% | 7.03% | 5.41% |
| SHDI | 20.26% | 15.00% | 21.51% | 3.86% | 4.25% | 3.05% |
| Building density | 11.10% | 5.38% | 11.44% | 5.34% | 5.42% | 4.26% |
| Building height | 15.45% | 7.74% | 15.77% | 5.88% | 5.97% | 4.69% |
| SDBH | 13.37% | 6.62% | 13.82% | 5.71% | 5.81% | 4.55% |
| NDVI | 15.53% | 18.38% | 3.91% | 2.63% | 3.18% | 2.53% |
| Road length | 10.83% | 5.60% | 11.72% | 4.96% | 5.10% | 4.01% |
| Road crossing | 6.31% | 2.95% | 6.43% | 2.94% | 3.07% | 2.53% |
| Forestland | 6.46% | 5.13% | 3.86% | 0.87% | 1.00% | 0.74% |
| Construction land | 14.46% | 8.34% | 16.01% | 6.27% | 6.42% | 4.99% |
| Water area | 5.53% | 6.41% | 5.56% | 0.98% | 1.04% | 0.89% |
| Hygiene facility | 6.02% | 3.38% | 6.08% | 4.28% | 4.35% | 3.60% |
| Government agency | 5.71% | 3.22% | 5.90% | 4.13% | 4.12% | 3.55% |
| Residential community | 7.00% | 3.82% | 7.14% | 4.69% | 4.74% | 3.95% |
| Industrial park | 3.11% | 1.82% | 3.45% | 1.07% | 1.20% | 0.86% |
| Traffic facilities | 6.58% | 3.37% | 6.53% | 4.22% | 4.17% | 3.62% |
| Gas station | 4.07% | 2.70% | 4.15% | 2.22% | 2.22% | 1.88% |
| Catering facility | 6.59% | 3.38% | 6.73% | 4.34% | 4.41% | 3.60% |
| AI | 15.29% | 15.80% | 10.01% | 4.76% | 4.98% | 4.20% |
| ED | 10.71% | 10.39% | 10.89% | 3.67% | 4.29% | 3.32% |

| | | | | | | |
|--------|--------|--------|--------|-------|-------|-------|
| PAFRAC | 10.07% | 12.76% | 5.01% | 3.28% | 3.81% | 3.13% |
| PD | 11.53% | 7.67% | 12.47% | 3.78% | 4.36% | 3.32% |

Table S2. The percentage of L-L type grids corresponding to Figure S1.

| | O3 | PM2.5 | NO2 | Non-accident mortality | Cardiovascular mortality | Respiratory mortality |
|--------------------------------|--------|--------|--------|------------------------|--------------------------|-----------------------|
| Diversity of built environment | 17.40% | 14.64% | 23.57% | 25.22% | 24.84% | 25.04% |
| Diversity of design | 19.62% | 16.46% | 25.28% | 26.89% | 26.37% | 26.67% |
| Diversity of POI | 13.59% | 11.72% | 17.51% | 19.51% | 19.23% | 19.38% |
| SHDI | 10.09% | 8.51% | 19.77% | 19.45% | 19.17% | 19.68% |
| Building density | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Building height | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| SDBH | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| NDVI | 8.54% | 12.30% | 7.44% | 17.87% | 17.76% | 18.81% |
| Road length | 17.50% | 15.63% | 21.47% | 24.20% | 23.85% | 24.01% |
| Road crossing | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Forestland | 0.49% | 0.45% | 0.66% | 1.05% | 1.06% | 1.07% |
| Construction land | 17.27% | 14.50% | 20.38% | 24.06% | 23.86% | 24.06% |
| Water area | 10.04% | 11.72% | 14.40% | 20.48% | 20.05% | 21.17% |
| Hygiene facility | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Government agency | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Residential community | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Industrial park | 0.12% | 0.06% | 0.17% | 0.20% | 0.20% | 0.20% |
| Traffic facilities | 15.21% | 13.44% | 18.80% | 21.33% | 20.98% | 21.04% |
| Gas station | 0.00% | 0.00% | 0.02% | 0.02% | 0.02% | 0.02% |
| Catering facility | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| AI | 19.87% | 19.73% | 20.64% | 26.66% | 26.08% | 26.90% |

| | | | | | | |
|--------|-------|-------|--------|--------|--------|--------|
| ED | 8.51% | 7.75% | 14.43% | 17.94% | 17.65% | 18.40% |
| PAFRAC | 6.58% | 7.48% | 8.37% | 16.53% | 16.35% | 17.16% |
| PD | 9.82% | 7.61% | 17.62% | 21.05% | 20.74% | 21.45% |

Table S3. The percentage of L-H type grids corresponding to Figure S1.

| | O3 | PM2.5 | NO2 | Non-accident mortality | Cardiovascular mortality | Respiratory mortality |
|--------------------------------|--------|--------|--------|------------------------|--------------------------|-----------------------|
| Diversity of built environment | 1.95% | 9.29% | 1.18% | 10.39% | 10.21% | 11.75% |
| Diversity of design | 1.23% | 8.18% | 0.52% | 9.27% | 9.20% | 10.48% |
| Diversity of POI | 2.98% | 9.34% | 2.33% | 10.36% | 10.15% | 11.77% |
| SHDI | 9.98% | 15.25% | 8.73% | 26.38% | 25.99% | 27.19% |
| Building density | 0.54% | 6.25% | 0.20% | 6.30% | 6.22% | 7.37% |
| Building height | 1.00% | 8.71% | 0.68% | 10.57% | 10.48% | 11.76% |
| SDBH | 0.81% | 7.55% | 0.36% | 8.47% | 8.36% | 9.62% |
| NDVI | 15.99% | 13.03% | 27.66% | 28.95% | 28.37% | 29.03% |
| Road length | 1.87% | 7.10% | 0.98% | 7.74% | 7.60% | 8.68% |
| Road crossing | 0.26% | 3.63% | 0.13% | 3.66% | 3.53% | 4.07% |
| Forestland | 6.65% | 7.97% | 9.24% | 12.23% | 12.10% | 12.36% |
| Construction land | 2.93% | 9.05% | 1.38% | 11.13% | 10.97% | 12.40% |
| Water area | 7.72% | 6.84% | 7.68% | 12.27% | 12.21% | 12.35% |
| Hygiene facility | 0.50% | 3.20% | 0.42% | 2.31% | 2.24% | 3.03% |
| Government agency | 0.69% | 3.29% | 0.51% | 2.36% | 2.39% | 2.97% |
| Residential community | 0.50% | 3.69% | 0.36% | 2.85% | 2.80% | 3.72% |
| Industrial park | 1.93% | 3.32% | 1.37% | 4.41% | 4.26% | 5.25% |
| Traffic facilities | 0.38% | 3.59% | 0.43% | 2.74% | 2.79% | 3.34% |
| Gas station | 2.91% | 4.22% | 3.09% | 5.85% | 5.81% | 6.19% |
| Catering facility | 0.50% | 3.20% | 0.36% | 2.78% | 2.70% | 3.50% |

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| AI | 8.11% | 7.61% | 13.40% | 18.64% | 18.43% | 19.20% |
| ED | 20.30% | 20.62% | 20.13% | 27.35% | 26.72% | 27.70% |
| PAFRAC | 20.20% | 17.51% | 25.25% | 26.99% | 26.46% | 27.14% |
| PD | 15.38% | 19.24% | 14.44% | 23.13% | 22.55% | 23.57% |

Table S4. The percentage of H-L type grids corresponding to Figure S1.

| | O3 | PM2.5 | NO2 | Non-accident mortality | Cardiovascular mortality | Respiratory mortality |
|--------------------------------|--------|--------|--------|------------------------|--------------------------|-----------------------|
| Diversity of built environment | 9.27% | 12.03% | 3.10% | 1.45% | 1.83% | 1.63% |
| Diversity of design | 9.43% | 12.72% | 3.69% | 2.08% | 2.61% | 2.28% |
| Diversity of POI | 8.70% | 11.26% | 3.82% | 1.32% | 1.69% | 1.39% |
| SHDI | 13.70% | 15.28% | 4.01% | 4.34% | 4.62% | 4.11% |
| Building density | 21.97% | 30.90% | 9.23% | 4.84% | 5.82% | 4.79% |
| Building height | 22.18% | 31.26% | 9.37% | 4.87% | 5.90% | 4.79% |
| SDBH | 28.55% | 38.48% | 13.81% | 6.61% | 7.72% | 6.37% |
| NDVI | 15.25% | 11.46% | 16.35% | 5.90% | 5.99% | 4.93% |
| Road length | 8.51% | 10.55% | 4.48% | 1.72% | 2.08% | 1.88% |
| Road crossing | 18.90% | 22.45% | 8.95% | 4.16% | 4.96% | 4.29% |
| Forestland | 26.55% | 29.37% | 21.64% | 7.62% | 8.00% | 6.43% |
| Construction land | 8.16% | 10.94% | 5.05% | 1.37% | 1.57% | 1.37% |
| Water area | 15.80% | 14.44% | 11.04% | 4.88% | 5.32% | 4.18% |
| Hygiene facility | 27.37% | 34.38% | 16.37% | 5.00% | 5.99% | 4.86% |
| Government agency | 14.63% | 19.85% | 7.84% | 1.93% | 2.39% | 1.93% |
| Residential community | 23.82% | 30.04% | 11.49% | 4.43% | 5.31% | 4.38% |
| Industrial park | 43.48% | 46.68% | 29.95% | 11.91% | 13.10% | 10.83% |
| Traffic facilities | 8.98% | 11.49% | 4.37% | 1.48% | 1.92% | 1.75% |
| Gas station | 38.02% | 42.14% | 25.61% | 8.77% | 9.96% | 7.89% |

| | | | | | | |
|-------------------|--------|--------|--------|-------|-------|-------|
| Catering facility | 18.70% | 34.38% | 9.03% | 3.49% | 4.30% | 3.38% |
| AI | 10.20% | 10.34% | 9.42% | 3.41% | 3.99% | 3.17% |
| ED | 14.13% | 14.88% | 8.20% | 4.69% | 4.98% | 4.23% |
| PAFRAC | 14.53% | 13.63% | 12.73% | 4.57% | 4.75% | 3.94% |
| PD | 16.20% | 18.40% | 8.37% | 4.93% | 5.24% | 4.53% |

Table S5. The percentage of not significant type grids corresponding to Figure S1.

| | O3 | PM2.5 | NO2 | Non-accident mortality | Cardiovascular mortality | Respiratory mortality |
|--------------------------------|--------|--------|--------|------------------------|--------------------------|-----------------------|
| Diversity of built environment | 56.52% | 56.52% | 56.52% | 56.52% | 56.52% | 56.52% |
| Diversity of design | 55.74% | 55.60% | 55.82% | 55.82% | 55.81% | 55.84% |
| Diversity of POI | 60.54% | 59.85% | 61.49% | 61.99% | 61.91% | 62.05% |
| SHDI | 45.97% | 45.97% | 45.97% | 45.97% | 45.97% | 45.97% |
| Building density | 66.40% | 57.46% | 79.13% | 83.53% | 82.54% | 83.57% |
| Building height | 61.37% | 52.29% | 74.18% | 78.68% | 77.65% | 78.76% |
| SDBH | 57.27% | 47.35% | 72.02% | 79.21% | 78.11% | 79.45% |
| NDVI | 44.69% | 44.82% | 44.63% | 44.66% | 44.69% | 44.71% |
| Road length | 61.30% | 61.12% | 61.36% | 61.38% | 61.37% | 61.41% |
| Road crossing | 74.52% | 70.96% | 84.49% | 89.24% | 88.45% | 89.11% |
| Forestland | 59.86% | 57.07% | 64.60% | 78.23% | 77.83% | 79.39% |
| Construction land | 57.18% | 57.18% | 57.18% | 57.18% | 57.18% | 57.18% |
| Water area | 60.92% | 60.60% | 61.31% | 61.39% | 61.38% | 61.41% |
| Hygiene facility | 66.11% | 59.04% | 77.14% | 88.41% | 87.42% | 88.52% |
| Government agency | 78.98% | 73.65% | 85.75% | 91.58% | 91.09% | 91.55% |
| Residential community | 68.67% | 62.44% | 81.01% | 88.03% | 87.15% | 87.95% |
| Industrial park | 51.36% | 48.11% | 65.06% | 82.41% | 81.23% | 82.86% |
| Traffic facilities | 68.85% | 68.11% | 69.87% | 70.23% | 70.15% | 70.26% |

| | | | | | | |
|-------------------|--------|--------|--------|--------|--------|--------|
| Gas station | 55.00% | 50.94% | 67.14% | 83.14% | 81.99% | 84.01% |
| Catering facility | 74.21% | 59.04% | 83.88% | 89.40% | 88.59% | 89.52% |
| AI | 46.53% | 46.53% | 46.53% | 46.53% | 46.53% | 46.53% |
| ED | 46.36% | 46.36% | 46.36% | 46.35% | 46.36% | 46.35% |
| PAFRAC | 48.62% | 48.62% | 48.62% | 48.62% | 48.62% | 48.62% |
| PD | 47.08% | 47.08% | 47.10% | 47.11% | 47.11% | 47.12% |
