

SUPPLEMENTARY INFORMATION

For the paper

Feasibility of urban waste for
constructing Technosols for plant growth

by:

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Table S1. ANOVA and Tukey’s tests for differences in soil physicochemical properties of the different Technic materials.

Soil pH

| Technic material | mean | SE | df | lower.CL | upper.CL | group |
|------------------|-------|--------|----|----------|----------|-------|
| Excavation | 8.15 | 0.0922 | 6 | 7.93 | 8.38 | A |
| Concrete | 8.74 | 0.0922 | 6 | 8.51 | 8.96 | B |
| Demolition | 10.18 | 0.0922 | 6 | 9.95 | 10.41 | C |

Soil EC

| Technic material | mean | SE | df | lower.CL | upper.CL | group |
|------------------|------|--------|----|----------|----------|-------|
| Excavation | 1.05 | 0.0841 | 6 | 848 | 1.26 | A |
| Concrete | 1.37 | 0.0841 | 6 | 1.164 | 1.58 | AB |
| Demolition | 1.73 | 0.0841 | 6 | 1.524 | 1.94 | B |

Leachate pH

| Technic material | mean | SE | df | lower.CL | upper.CL | group |
|------------------|------|--------|----|----------|----------|-------|
| Excavation | 8.17 | 0.0962 | 6 | 7.93 | 8.4 | A |
| Concrete | 8.40 | 0.0962 | 6 | 8.16 | 8.64 | AB |
| Demolition | 8.60 | 0.0962 | 6 | 8.36 | 8.84 | B |

Leachate EC

| Technic material | mean | SE | df | lower.CL | upper.CL | group |
|------------------|-------|-----|----|----------|----------|-------|
| Excavation | 9.53 | 537 | 6 | 8.22 | 10.8 | A |
| Concrete | 12.33 | 537 | 6 | 11.02 | 13.6 | B |
| Demolition | 13.93 | 537 | 6 | 12.62 | 15.2 | B |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S2. ANOVA and Tukey's test for soil physicochemical variables (considering the compost application rates, regardless of the Technic material).

| Soil pH | | | | | | |
|----------------|------|-----|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
| High | 8.87 | 603 | 6 | 7.4 | 10.3 | A |
| Intermediate | 9.02 | 603 | 6 | 7.54 | 10.5 | A |
| Low | 9.18 | 603 | 6 | 7.7 | 10.7 | A |

| Soil EC | | | | | | |
|----------------|------|-----|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
| Low | 1.24 | 197 | 6 | 762 | 1.72 | A |
| Intermediate | 1.39 | 197 | 6 | 905 | 1.87 | A |
| High | 1.52 | 197 | 6 | 1.042 | 2 | A |

| Leachate pH | | | | | | |
|--------------------|------|-----|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
| High | 8.23 | 132 | 6 | 7.91 | 8.56 | A |
| Intermediate | 8.40 | 132 | 6 | 8.08 | 8.72 | A |
| Low | 8.53 | 132 | 6 | 8.21 | 8.86 | A |

| Leachate EC | | | | | | |
|--------------------|-------|-----|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
| Low | 11.10 | 1.3 | 6 | 7.88 | 14.3 | A |
| Intermediate | 12.00 | 1.3 | 6 | 8.78 | 15.2 | A |
| High | 12.80 | 1.3 | 6 | 9.58 | 16 | A |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S3. ANOVA and Tukey's test for soil cations content (considering the compost application rates, regardless of the Technic material).

| Soluble Ca²⁺ | | | | | | |
|--------------------------------|------|------|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | Group |
| Low | 216 | 47.1 | 6 | 101 | 331 | A |
| Intermediate | 262 | 47.1 | 6 | 146 | 377 | A |
| High | 338 | 47.1 | 6 | 223 | 453 | A |

| Soluble Mg²⁺ | | | | | | |
|--------------------------------|------|------|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | Group |
| Low | 43.3 | 31.2 | 6 | -32.9 | 120 | A |
| Intermediate | 62.7 | 31.2 | 6 | -13.6 | 139 | A |
| High | 88.3 | 31.2 | 6 | 12.1 | 165 | A |

| Soluble K⁺ | | | | | | |
|------------------------------|------|------|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | Group |
| Low | 55 | 11.3 | 6 | 27.4 | 82.6 | A |
| Intermediate | 118 | 11.3 | 6 | 90.4 | 145.6 | B |
| High | 216 | 11.3 | 6 | 188.4 | 243.6 | C |

| Soluble Na⁺ | | | | | | |
|-------------------------------|------|------|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | Group |
| Low | 131 | 27.3 | 6 | 64.3 | 198 | A |
| Intermediate | 153 | 27.3 | 6 | 86.3 | 220 | A |
| High | 185 | 27.3 | 6 | 118.6 | 252 | A |

| Soluble NH₄⁺ | | | | | | |
|---|------|-----|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | Group |
| Intermediate | 1.67 | 577 | 6 | 254 | 3.08 | A |
| High | 1.67 | 577 | 6 | 254 | 3.08 | A |
| Low | 2.33 | 577 | 6 | 921 | 3.75 | A |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S4. ANOVA and Tukey's test for soil anions content (considering the compost application rates, regardless of the Technic material).

HCO₃⁻

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|------|-----|----|----------|----------|-------|
| Intermediate | 500 | 153 | 6 | 125 | 874 | A |
| High | 523 | 153 | 6 | 149 | 898 | A |
| Low | 609 | 153 | 6 | 235 | 983 | A |

Cl⁻

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|------|------|----|----------|----------|-------|
| Low | 206 | 32.3 | 6 | 127 | 285 | A |
| Intermediate | 277 | 32.3 | 6 | 198 | 356 | AB |
| High | 405 | 32.3 | 6 | 326 | 484 | B |

NO₃⁻

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|------|------|----|----------|----------|-------|
| Low | 541 | 94.6 | 6 | 310 | 773 | A |
| Intermediate | 862 | 94.6 | 6 | 630 | 1093 | A |
| High | 1449 | 94.6 | 6 | 1218 | 1681 | B |

SO₄²⁻

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|------|-----|----|----------|----------|-------|
| Low | 497 | 125 | 6 | 191 | 802 | A |
| Intermediate | 546 | 125 | 6 | 240 | 852 | A |
| High | 617 | 125 | 6 | 311 | 922 | A |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S5. ANOVA and Tukey's test for soil nutrients content (considering the compost application rates, regardless of the Technic material).

Total C

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|------|------|----|----------|----------|-------|
| Low | 19 | 4.42 | 6 | 8.21 | 29.9 | A |
| Intermediate | 25.9 | 4.42 | 6 | 15.07 | 36.7 | A |
| High | 33.7 | 4.42 | 6 | 22.91 | 44.6 | A |

Total N

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|------|-----|----|----------|----------|-------|
| Low | 1.17 | 105 | 6 | 909 | 1.42 | A |
| Intermediate | 1.83 | 105 | 6 | 1.575 | 2.09 | B |
| High | 2.57 | 105 | 6 | 2.309 | 2.82 | C |

C-to-N ratio

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|------|------|----|----------|----------|-------|
| High | 13.1 | 2.24 | 6 | 7.57 | 18.5 | A |
| Intermediate | 13.9 | 2.24 | 6 | 8.44 | 19.4 | A |
| Low | 16.2 | 2.24 | 6 | 10.67 | 21.6 | A |

DOC

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|-------|------|----|----------|----------|-------|
| Intermediate | 31.8 | 24.9 | 5 | -32.2 | 95.9 | A |
| Low | 50.3 | 30.5 | 5 | -28.1 | 128.8 | AB |
| High | 154.2 | 24.9 | 5 | 90.1 | 218.2 | B |

DIC

| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
|---------------|------|--------|----|----------|----------|-------|
| Low | 214 | 0.0379 | 5 | 117 | 312 | A |
| Intermediate | 228 | 0.0309 | 5 | 148 | 308 | A |
| High | 235 | 0.0309 | 5 | 156 | 315 | A |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S6. ANOVA and Tukey's test for soil nutrients content (considering the type of Technic material).

| Total C | | | | | | |
|------------------|-------|------|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Excavation | 20.00 | 4.34 | 6 | 9.34 | 30.6 | A |
| Concrete | 24.20 | 4.34 | 6 | 13.54 | 34.8 | A |
| Demolition | 34.50 | 4.34 | 6 | 23.9 | 45.2 | A |

| Total N | | | | | | |
|------------------|------|-----|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Concrete | 1.77 | 408 | 6 | 768 | 2.77 | A |
| Excavation | 1.77 | 408 | 6 | 768 | 2.77 | A |
| Demolition | 2.03 | 408 | 6 | 1.034 | 3.03 | A |

| C-to-N ratio | | | | | | |
|---------------------|-------|-----|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Excavation | 11.10 | 1.4 | 6 | 7.7 | 14.6 | A |
| Concrete | 14.10 | 1.4 | 6 | 10.6 | 17.5 | AB |
| Demolition | 18.00 | 1.4 | 6 | 14.5 | 21.4 | B |

| DOC | | | | | | |
|------------------|-------|------|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Demolition | 66.40 | 47.1 | 5 | -54.5 | 187 | A |
| Excavation | 88.90 | 47.1 | 5 | -32 | 210 | A |
| Concrete | 96.30 | 57.6 | 5 | -51.9 | 244 | A |

| DIC | | | | | | |
|------------------|------|--------|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Demolition | 0.20 | 0.0211 | 5 | 143 | 252 | A |
| Excavation | 0.22 | 0.0211 | 5 | 168 | 277 | A |
| Concrete | 0.28 | 0.0258 | 5 | 213 | 346 | A |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S7. ANOVA and Tukey's test for soil metals content (considering the type of thecnic material).

| Fe | | | | | | |
|------------------|------|---------|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Demolition | 0.02 | 0.00902 | 6 | 0.000928 | 0.0451 | A |
| Excavation | 0.06 | 0.00902 | 6 | 0.040261 | 0.0844 | B |
| Concrete | 0.07 | 0.00902 | 6 | 0.045928 | 0.0901 | B |

| Cu | | | | | | |
|------------------|------|---------|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Excavation | 0.05 | 0.00378 | 6 | 0.0378 | 0.0562 | A |
| Concrete | 0.05 | 0.00378 | 6 | 0.0381 | 0.0566 | A |
| Demolition | 0.06 | 0.00378 | 6 | 0.0498 | 0.0682 | A |

| Mo | | | | | | |
|------------------|------|---------|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Excavation | 0.02 | 0.00398 | 6 | 0.0133 | 0.0327 | A |
| Concrete | 0.05 | 0.00398 | 6 | 0.0403 | 0.0597 | B |
| Demolition | 0.08 | 0.00398 | 6 | 0.0666 | 0.0861 | C |

| Mn | | | | | | |
|------------------|------|---------|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Demolition | 0.00 | 0.00902 | 6 | -0.0201 | 0.0241 | A |
| Concrete | 0.05 | 0.00902 | 6 | 0.0246 | 0.0687 | B |
| Excavation | 0.05 | 0.00902 | 6 | 0.0269 | 0.0711 | B |

| Al | | | | | | |
|------------------|------|--------|----|----------|----------|-------|
| Technic material | mean | SE | df | lower.CL | upper.CL | group |
| Demolition | 0.02 | 0.0133 | 6 | -0.00923 | 0.0559 | A |
| Excavation | 0.06 | 0.0133 | 6 | 0.02711 | 0.0922 | A |
| Concrete | 0.07 | 0.0133 | 6 | 0.04044 | 0.1056 | A |

Ni

| Technic material | mean | SE | df | lower.CL | upper.CL | group |
|------------------|------|---------|----|----------|----------|-------|
| Excavation | 0.01 | 0.00043 | 6 | 0.00461 | 0.00672 | A |
| Concrete | 0.01 | 0.00043 | 6 | 0.00495 | 0.00705 | A |
| Demolition | 0.01 | 0.00043 | 6 | 0.00828 | 0.01039 | B |

V

| Technic material | mean | SE | df | lower.CL | upper.CL | group |
|------------------|------|---------|----|----------|----------|-------|
| Excavation | 0.01 | 0.00342 | 6 | 0.00298 | 0.0197 | A |
| Concrete | 0.01 | 0.00342 | 6 | 0.00431 | 21 | A |
| Demolition | 0.05 | 0.00342 | 6 | 0.04231 | 59 | B |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S8. ANOVA and Tukey's test plant growth parameters (considering the type of Technic material).

Plant height

| Technic material | mean | SE | df | lower.CL | upper.CL | group |
|------------------|------|------|----|----------|----------|-------|
| Demolition | 50.0 | 2.68 | 6 | 47.5 | 52.4 | B |
| Concrete | 53.8 | 2.68 | 6 | 51.4 | 56.2 | B |
| Excavation | 64.2 | 2.68 | 6 | 61.8 | 66.7 | C |
| Control | 13.0 | 2.68 | 6 | 8.8 | 17.2 | A |

Plant biomass

| Technic material | mean | SE | df | lower.CL | upper.CL | group |
|------------------|-------|-----|----|----------|----------|-------|
| Demolition | 6.35 | 1.2 | 6 | 3.42 | 9.27 | A |
| Concrete | 10.39 | 1.2 | 6 | 7.46 | 13.31 | AB |
| Excavation | 12.76 | 1.2 | 6 | 9.83 | 15.68 | B |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S9. ANOVA and Tukey's test plant growth parameters (considering the compost application rates, regardless of the Technic material).

| Plant height | | | | | | |
|---------------------|------|------|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
| Low | 52.4 | 4.56 | 6 | 41.3 | 63.6 | B |
| Intermediate | 55.7 | 4.56 | 6 | 44.6 | 66.9 | BC |
| High | 59.8 | 4.56 | 6 | 48.6 | 71 | C |
| Control | 13.0 | 4.56 | 6 | 6.7 | 19.2 | A |

| Plant biomass | | | | | | |
|----------------------|-------|------|----|----------|----------|-------|
| Compost rates | mean | SE | df | lower.CL | upper.CL | group |
| Low | 7.69 | 1.88 | 6 | 3.1 | 12.3 | A |
| Intermediate | 10.01 | 1.88 | 6 | 5.42 | 14.6 | A |
| High | 11.79 | 1.88 | 6 | 7.2 | 16.4 | A |

SE = standard error; df = degrees of freedom; CL = confidence level.

Table S10. Principal components for the importance of soil physical, chemical and physicochemical variables of Technosols produced from construction wastes enhanced with compost.

| Variables | PC1 | PC2 |
|------------------------------|------------|------------|
| Soil pH | 0.997*** | 0.025 |
| Soluble V | 0.949*** | 0.035 |
| Soluble Mo | 0.901*** | 0.265 |
| Plant biomass | -0.888** | -0.426 |
| Soluble Mg | -0.885** | -0.321 |
| C:N ratio | 0.873** | 0.217 |
| Soluble Ni | 0.872** | 0.401 |
| Soluble Mn | -0.845** | -0.055 |
| Soil electrical conductivity | 0.845** | 0.490 |
| Soluble Fe | -0.818** | -0.104 |
| Plant height | -0.806** | -0.274 |
| Particle density | -0.804** | -0.396 |

| | | |
|--|--------------|--------------|
| Soluble Na | 0.756* | 0.605 |
| Total N | 0.084 | 0.961*** |
| Soluble K | 0.128 | 0.961*** |
| Bulk density | -0.197 | -0.948*** |
| Porosity | 0.233 | 0.925*** |
| Nitrate -N (NO ₃ ⁻) | 0.384 | 0.907*** |
| Soluble Cl ⁻ | 0.460 | 0.846** |
| Dissolved organic carbon | 0.232 | 0.754* |
| Eigenvalues | 1.07 | 7.27 |
| Proportion | 51.02 | 34.61 |
| Cumulative | 51.02 | 85.63 |

* p<0.05, ** p<0.01, *** p<0.001

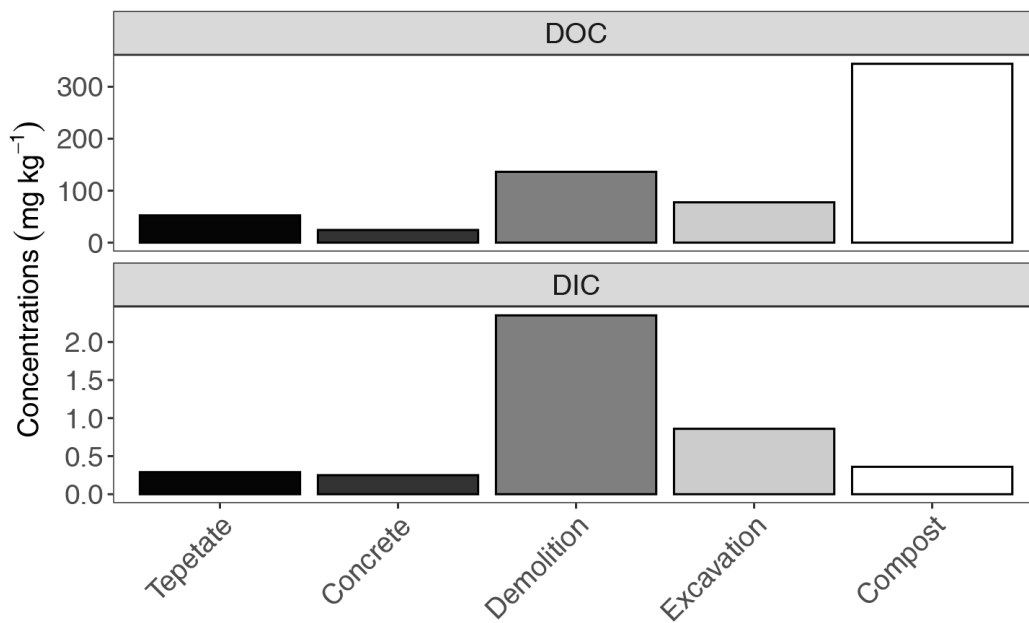


Figure S1. Concentrations of readily available carbon fractions in the feedstocks.

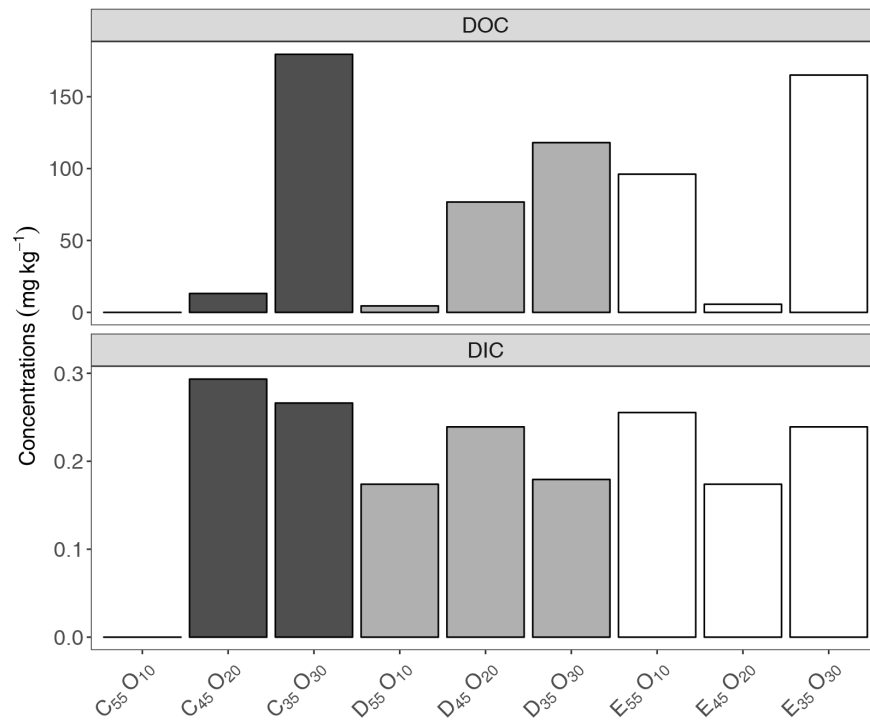


Figure S2. Concentrations of readily available carbon fractions in the evaluated Technosols.

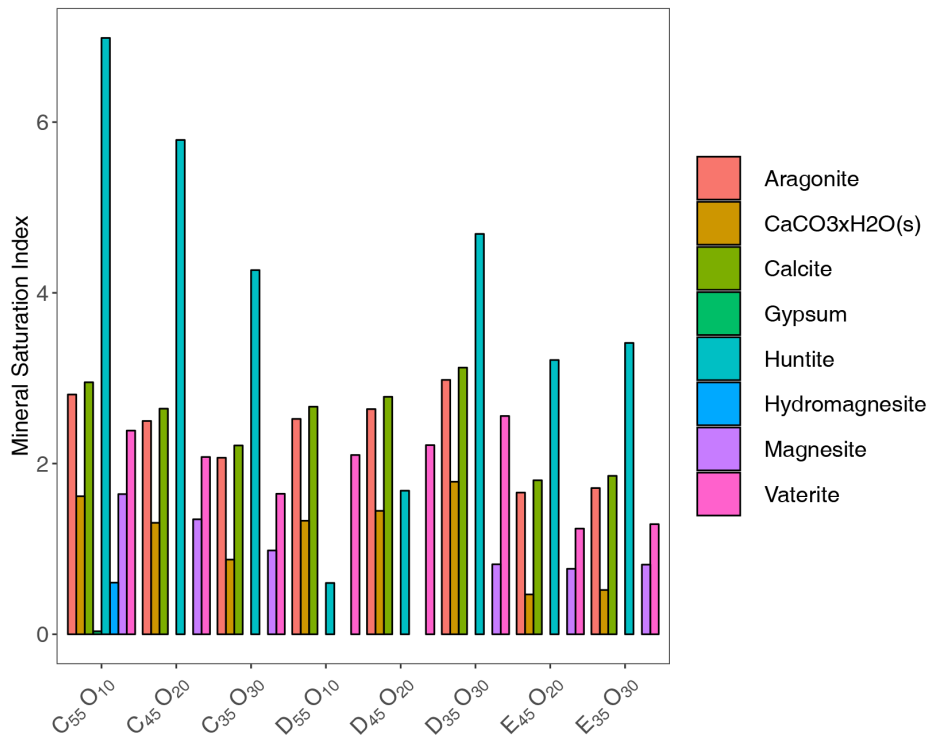


Figure S3. Mineral Saturation Index illustrating the precipitated mineral species in the evaluated Technosols.