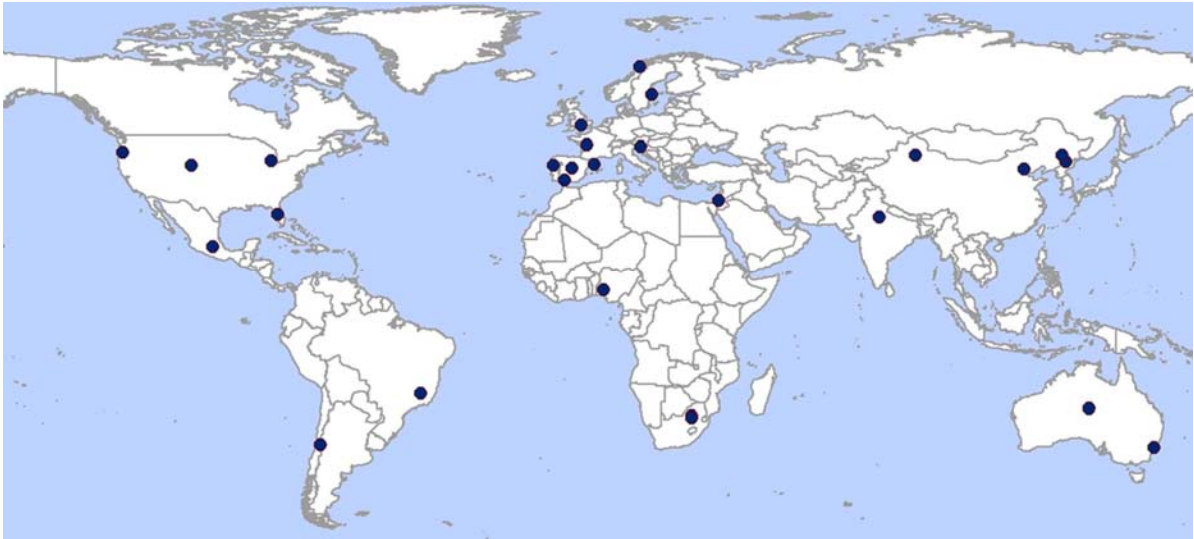
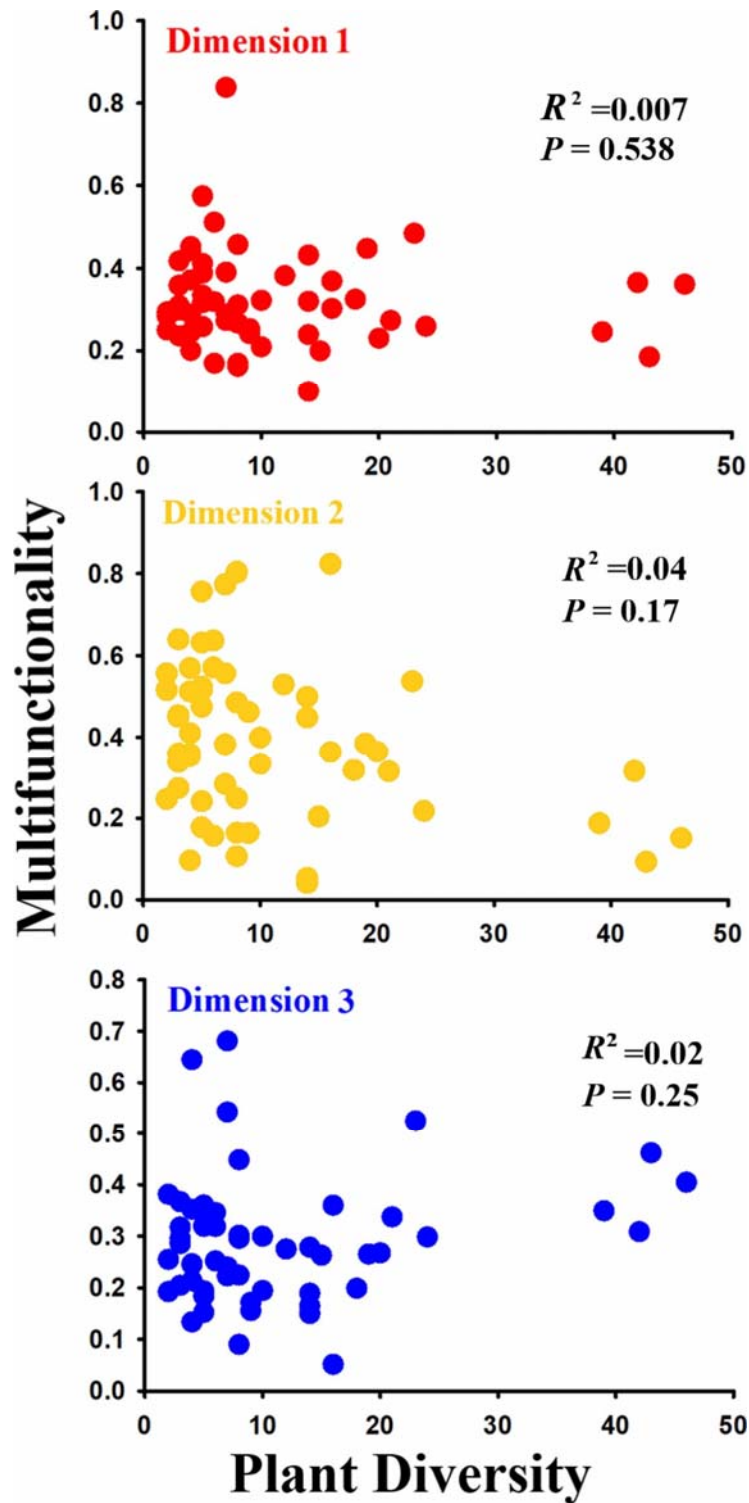


Extended data



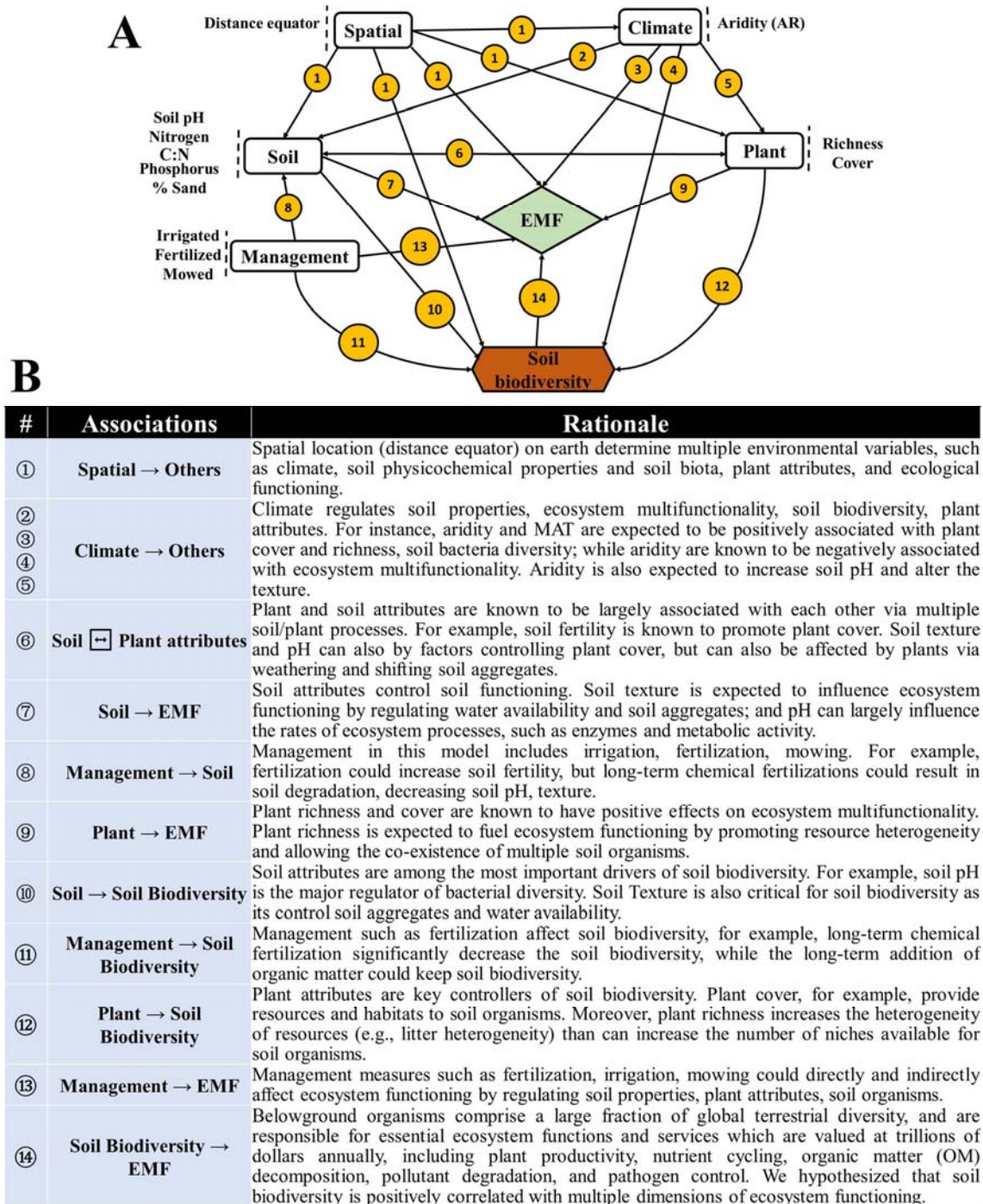
Extended Data Fig. 1 Location of the 27 urban greenspaces selected for shotgun sequencing analyses.

Location of the 27 urban greenspaces selected for shotgun sequencing analyses and covering the entire biogeographical range in Fig. 1.



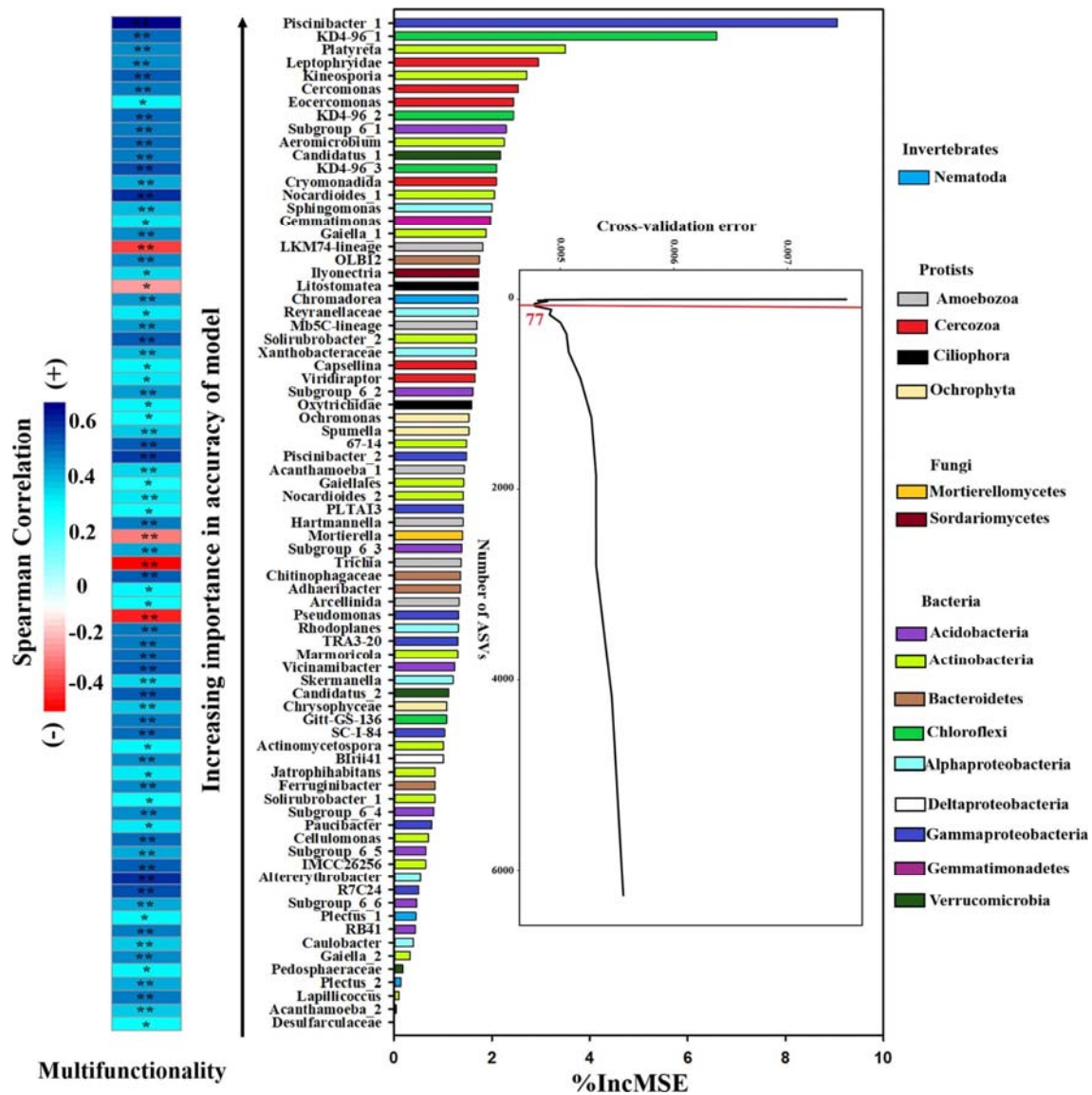
Extended Data Fig. 2 Ordinary least squares linear regression between plant diversity and the multiple dimensions of ecosystem functions.

Ordinary least squares linear regression between plant diversity and the multiple dimensions of ecosystem functions, $n = 56$ study sites.



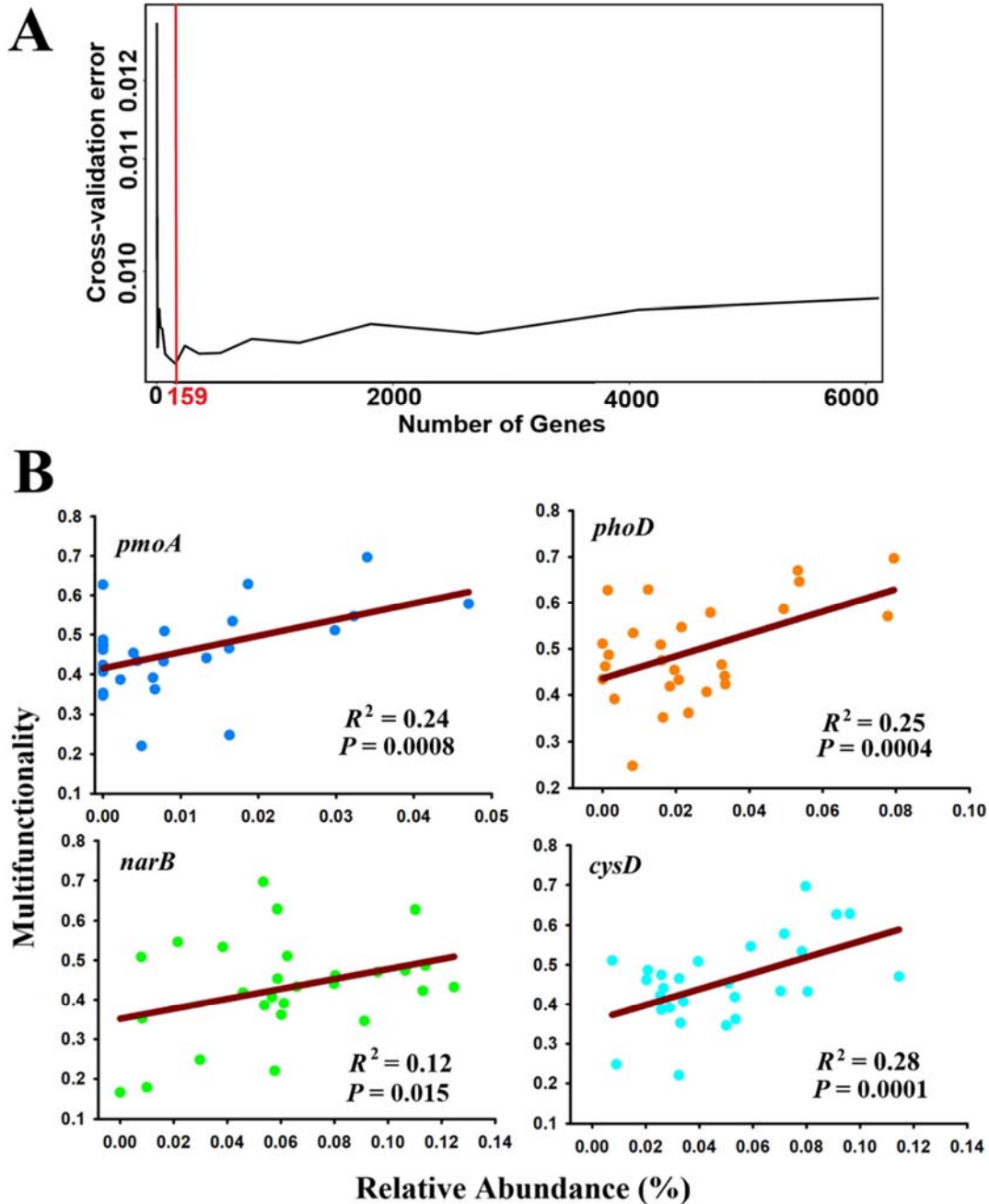
Extended Data Fig. 3 Conceptual model investigating the direct and indirect linkages between soil biodiversity and ecosystem function.

Conceptual model investigating the direct and indirect linkages between soil biodiversity and ecosystem function. (a) A priori structural equation modeling (SEM) metamodel aimed to evaluate the link between soil biodiversity and ecosystem multifunctionality after controlling for key ecological predictors such as space, climate, and soil and plant attributes. (b) Explanations for each association link priori structural equation modeling metamodel.



Extended Data Fig. 4 Random forest model detects soil biota that are accurately predictive of ecosystem multifunctionality in urban greenspaces across the globe.

Random forest model detects soil biota that are accurately predictive of ecosystem multifunctionality in urban greenspaces across the globe. The result of predicting ecosystem multifunctionality in urban greenspaces across the globe using the random forest (RF) models for the soil biota of the selected groups (bacteria, fungi, protists, and invertebrates). Heat maps of the relative abundance of the 77 indicative soil biota and ecosystem multifunctionality. Statistical analysis was performed using two-sided spearman correlations; P values were adjusted by Benjamini Hochberg false discovery correction, and indicated by asterisks, ‘*’ represents Benjamini Hochberg-adjusted $0.01 < P \leq 0.05$; ‘**’ represents Benjamini Hochberg-adjusted $P \leq 0.01$; $n = 56$ study sites.



Extended Data Fig. 5 Random forest model detects soil genes that are accurately predictive of ecosystem multifunctionality in urban greenspaces across the globe.

Random forest model detects soil genes that are accurately predictive of ecosystem multifunctionality in urban greenspaces across the globe. **(a)** Random forest model detects 159 genes in contributing to the ecosystem multifunctionality in urban greenspaces across the globe. **(b)** Ordinary least squares linear regression between multifunctionality and the proportion of the selected nutrient cycling associated genes: methane monooxygenase subunit A encoding (*pmoA*) gene, ferredoxin-nitrate reductase encoding (*narB*) gene, alkaline phosphatase D encoding (*phoD*) gene, and sulfate adenylyltransferase subunit 2 encoding (*cysD*) gene; $n = 27$ study sites.