Supplementary Material: Dimensions of biodiversity loss: spatial mismatch in land-use impacts on species, functional and phylogenetic diversity of European bees

De Palma et al

Appendix S1 Dataset collation

Table S1.1: The following are data sources used in this analysis. See De Palma *et al.* (2016) for full details of dataset compilation. [†]Data are taken from the PREDICTS database (openly available via http://data.nhm.ac.uk; Hudson *et al.*, 2017). [‡]Data are available from the referenced paper. For all other datasets, please contact the corresponding author of that paper directly.

Source Number	Reference
1	Kruess & Tscharntke (2002)
2	Quaranta $et~al.~(2004)^{\dagger}$
3	Marshall <i>et al.</i> $(2006)^{\dagger}$
4	Meyer <i>et al.</i> $(2007)^{\dagger}$
5	Billeter et al. $(2007)^{\dagger}$,
	Diekötter et al. $(2008)^{\dagger}$ and Le
	Féon <i>et al.</i> $(2010)^{\dagger}$
6	Franzén & Nilsson $(2008)^{\dagger}$

7	Kohler <i>et al.</i> $(2007)^{\dagger}$
8	Albrecht et al. (2010)
9	Bates <i>et al.</i> $(2011)^{\dagger}$
10	Power & Stout $(2011)^{\dagger}$
11	Samnegård $et~al.~(2011)^{\dagger}$
12	Schüepp <i>et al.</i> $(2011)^{\dagger}$
13	Weiner et al. (2011)
14	Hanley $(2011)^{\dagger}$
15	Mudri-Stojnic et al. $(2012)^{\dagger\ddagger}$
16	Jauker et al. (2013); Meyer
	<i>et al.</i> $(2009)^{\dagger}$
17	Fowler $(2014)^{\dagger}$



Figure S1.1: Map of sites in Europe from which bee abundance data were available. The size of the points correspond to the number of bee species sampled at the site (log-transformed). Note that all points are semi-transparent; points that appear opaque are therefore indicative of areas where multiple sites have been sampled.

Level 1 Land Use	Predominant Land Use	Minimal use	Light use	Intense use
No evidence of prior	Primary forest	Any disturbances identified are very	One or more disturbances of	One or more disturbances that is
destruction of the		minor (e.g., a trail or path) or very	moderate intensity (e.g., selective	severe enough to markedly change
vegetation		limited in the scope of their effect	logging) or breadth of impact (e.g.,	the nature of the ecosystem; this
		(e.g., hunting of a particular species	bushmeat extraction), which are not	includes clear-felling of part of the
		of limited ecological importance).	severe enough to markedly change	site too recently for much recovery
			the nature of the ecosystem.	to have occurred. Primary sites in
			Primary sites in suburban settings	fully urban settings should be
			are at least Light use.	classed as Intense use.
	Primary Non-Forest	As above	As above	As above
Recovering after	Mature Secondary	As for Primary Vegetation-Minimal	As for Primary Vegetation-Light use	As for Primary Vegetation-Intense
destruction of the	Vegetation	use		use
vegetation				
	Intermediate	As for Primary Vegetation-Minimal	As for Primary Vegetation-Light use	As for Primary Vegetation-Intense
	Secondary	use		use
	Vegetation			
	Young Secondary	As for Primary Vegetation-Minimal	As for Primary Vegetation-Light use	As for Primary Vegetation-Intense
	Vegetation	use		use
	Secondary	As for Primary Vegetation-Minimal	As for Primary Vegetation-Light use	As for Primary Vegetation-Intense
	Vegetation	use		use
	(indeterminate age)			

Table S1.2: Land-use class and intensity definitions as used in Hudson *et al.* (2014)

Human use	Plantation forest	Extensively managed or mixed	Monoculture fruit/coffee/rubber	Monoculture fruit/coffee/rubber
(agricultural)		timber, fruit/coffee, oil-palm or	plantations with limited pesticide	plantations with significant
		rubber plantations in which native	input, or mixed species plantations	pesticide input.Monoculture timber
		understorey and/or other native	with significant inputs.	plantations with similarly aged trees
		tree species are tolerated, which are	Monoculture timber plantations of	or timber/oil-palm plantations with
		not treated with pesticide or	mixed age with no recent (< 20 $$	extensive recent $(< 20 \text{ years})$
		fertiliser, and which have not been	years) clear-felling. Monoculture	clear-felling.
		recently (< 20 years) clear-felled.	oil-palm plantations with no recent	
			(< 20 years) clear-felling.	
	Cropland	Low-intensity farms, typically with	Medium intensity farming, typically	High-intensity monoculture farming,
		small fields, mixed crops, crop	showing some but not many of the	typically showing many of the
		rotation, little or no inorganic	following: large fields, annual	following features: large fields,
		fertiliser use, little or no pesticide	ploughing, inorganic fertiliser	annual ploughing, inorganic
		use, little or no ploughing, little or	application, pesticide application,	fertiliser application, pesticide
		no irrigation, little or no	irrigation, no crop rotation,	application, irrigation,
		mechanisation.	mechanisation, monoculture crop.	mechanisation, no crop rotation.
			Organic farms in developed	
			countries often fall within this	
			category, as may high-intensity	
			farming in developing countries.	
	Pasture	Pasture with minimal input of	Pasture either with significant input	Pasture with significant input of
		fertiliser and pesticide, and with low	of fertiliser or pesticide, or with	fertiliser or pesticide, and with high
		stock density (not high enough to	high stock density (high enough to	stock density (high enough to cause
		cause significant disturbance or to	cause significant disturbance or to	significant disturbance or to stop
		stop regeneration of vegetation).	stop regeneration of vegetation).	regeneration of vegetation).
Human use (urban)	Urban	Extensive managed green spaces;	Suburban (e.g. gardens), or small	Fully urban with no significant
		villages.	managed or unmanaged green	green spaces.
			spaces in cities.	

		univoltine or hivoltine. by local threats	holes versus those that don't. Excavators are particular about nesting sites, often requiring ha bare ground or pithy stems, whilst those that don't excavate use existing cavities or old nesti sites, regardless of nest location. The sociality of the species was defined according to how their offspring are raised, because t relates to reproductive capacity. Social species, or those that raise their young in social ne (such as social parasites), are able to produce greater numbers of offspring because there a more workers to provision those offspring. Primitively eusocial species are able to adjust th reproductive capacity, often according to resource requirements: for example, <i>Halictus rubicum</i> is social in warmer, more resource rich areas but solitary in other areas. Species with no lecty status are those which do not collect their own pollen, for example cl toparasites. Phenotypic flexibility can be considered as a form of generalism so species that c be either oligolectic or polylectic are considered in the same category as the pollen generalists. Species were split into two categories: those with only one generation per year, and those that have or can have more than one generation per year, as the latter are predicted to be less impact by local threats	Excavators in the soil c vegetation Carder bees, renters, masons, cleptoparasites and social parasites Solitary, solitary or communal, communal, cleptoparasitic Highly eusocial, primitively eusocial, solitary/primitively eusocial, polymorphic, social parasites No Lecty status Oligolectic Polylectic polylectic Polylectic Nivoltine Bivoltine, multivoltine, univoltine or bivoltine,	Coarsened factor levels Excavators Non-excavators Obligately solitary Not obligately solitary Not obligately solitary No Lecty status Obligately oligolectic Polylectic/Flexible Univoltine Multivoltine/Flexible
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Appendix S1.1 Species list, based on taxonomy from Michener (2000)

Amegilla quadrifasciata	Andrena florivaga
Andrena agilissima	Andrena fucata
Andrena alfkenella	Andrena fulva
Andrena angustior	Andrena fulvago
Andrena anthrisci	Andrena fulvata
Andrena barbilabris	Andrena fulvida
Andrena bicolor	Andrena fuscipes
Andrena bucephala	Andrena gravida
Andrena carantonica	Andrena haemorrhoa
Andrena chrysopus	$Andrena\ hattorfiana$
Andrena chrysosceles	Andrena helvola
Andrena cineraria	Andrena humilis
Andrena cinerea	$Andrena\ intermedia$
Andrena clarkella	Andrena labialis
Andrena coitana	Andrena labiata
Andrena combinata	Andrena lagopus
Andrena congruens	Andrena lapponica
Andrena curvunaula	Andrena lathyri
Andrena deciniano	$Andrena\ minutula$
	$Andrena\ minutuloides$
Anarena aenticulata	$Andrena\ miserabilis$
Andrena distinguenda	Andrena mitis
Andrena dorsata	$Andrena \ nasuta$
Andrena enslinella	$Andrena \ nigroaenea$
Andrena falsifica	Andrena nigroolivacea
Andrena flavipes	Andrena nitida
Andrena florea	$Andrena \ nitidius cula$
Andrena floricola	$Andrena\ niveata$

Andrena ovatula	$\ Anthophora\ aestival is$
Andrena pandellei	$Anthophora\ atroalba$
Andrena pilipes	Anthophora dispar
Andrena praecox	$Anthophora\ furcata$
Andrena propingua	$Anthophora\ plumipes$
Andrena proxima	$Anthophora\ retusa$
Andrena rosae	Apis mellifera
Andrena rufa	$Bombus\ barbutellus$
	$Bombus\ bohemicus$
Anarena rujicrus	$Bombus\ campestris$
Andrena sabulosa	Bombus cryptarum
Andrena saundersella	Bombus distinguendus
Andrena semilaevis	$Bombus\ gerstaeckeri$
Andrena similis	Bombus hortorum
Andrena strohmella	Bombus humilis
Andrena subopaca	Bombus hypnorum
Andrena synadelpha	Bombus jonellus
Andrena tarsata	Bombus lapidarius
Andrena tibialis	Bombus lucorum
Andrena ungeri	Bombus magnus
Andrena vaaa	Bombus monticola
Androng segurate	Bombus muscorum
	Bombus norvegicus
Anarena ventralis	$Bombus\ pascuorum$
Andrena viridescens	Bombus pomorum
Andrena vulpecula	Bombus pratensis
Andrena wilkella	Bombus pratorum
Anthidiellum strigatum	Bombus ruderarius
Anthidium manicatum	Bombus ruderatus
Anthidium punctatum	Bombus rupestris

Bombus schrencki	$Eucera\ longicornis$
Bombus semenoviellus	$Eucera\ nigrescens$
Bombus soroeensis	Halictus confusus
Bombus subterraneus	Halictus gemmeus
Bombus sylvarum	Halictus kessleri
Bombus sylvestris	$Halictus\ langebardicus$
Bombus terrestris	Halictus maculatus
Bombus vestalis	Halictus patellatus
Bombus veteranus	Halictus pollinosus
Rombus suurflanii	$Halictus \ quadricinctus$
Bomous wurftenn	Halictus rubicundus
Camptopoeum frontale	$Halictus\ scabiosae$
Ceratina cucurbitina	Halictus semitectus
Ceratina cyanea	$Halictus\ simplex$
Ceratina nigrolabiata	$Halictus\ subauratus$
Chelostoma campanularum	Halictus tumulorum
Chelostoma distinctum	Heriades crenulatus
Chelostoma florisomne	Heriades truncorum
Chelostoma rapunculi	$Hoplitis \ anthocopoides$
Coelioxys inermis	Hoplitis claviventris
Coelioxys rufescens	Hoplitis leucomelana
Colletes cunicularius	$Hylaeus \ angustatus$
Collatas daviasanus	Hylaeus annularis
	Hylaeus brevicornis
Colletes floralis	Hylaeus communis
Colletes succinctus	Hylaeus confusus
Dasypoda plumipes	Hylaeus difformis
Dufourea dentiventris	Hylaeus gibbus
Eucera clypeata	Hylaeus gredleri
	TT 1 1 1

Hylaeus nigritus	$Lasioglossum\ lucidulum$
Hylaeus paulus	Lasioglossum majus
Hylaeus punctatus	$Lasioglossum\ malachurum$
Hylaeus rinki	$Lasioglossum\ minutissimum$
Hylaeus signatus	$Lasioglossum\ minutulum$
Hylaeus sinuatus	$Lasioglossum\ morio$
Hylaeus styriacus	$Lasioglossum \ nigripes$
Hulaeus variegatus	$Lasioglossum\ nitidius culum$
Lasialassum aeratum	$Lasioglossum\ nitidulum$
	$Lasioglossum \ pallens$
Lasioglossum albipes	$Lasioglossum\ parvulum$
Lasioglossum albocinctum	$Lasioglossum\ pauperatum$
Lasioglossum brevicorne	Lasioglossum pauxillum
Lasioglossum calceatum	$Lasioglossum \ politum$
Lasioglossum clypeare	$Lasioglossum\ punctatissimum$
Lasioglossum corvinum	$Lasioglossum\ puncticolle$
Lasioglossum costulatum	$Lasioglossum \ pygmaeum$
Lasioglossum cupromicans	$Lasioglossum\ quadrinotatum$
Lasioglossum discum	$Lasioglossum \ rufitarse$
Lasioglossum fratellum	$Lasioglossum\ sabulosum$
Lasioglossum fulvicorne	$Lasioglossum \ semilucens$
Lasioalossum alabriusculum	$Lasioglossum\ sexnotatum$
	$Lasioglossum\ sexstrigatum$
Lasioglossum interruptum	$Lasioglossum\ smeathmanellum$
Lasioglossum laevigatum	$Lasioglossum\ subfasciatum$
Lasioglossum laticeps	$Lasioglossum\ tricinctum$
Lasioglossum lativentre	Lasioglossum villosulum
Lasioglossum leucopus	$Lasioglossum\ xanthopus$
Lasioglossum leucozonium	Lasioglossum zonulum
Lasioglossum lineare	Lithurgus cornutus

Macropis europaea	$Nomada\ fucata$
Macropis fulvipes	Nomada fulvicornis
Megachile albisecta	Nomada goodeniana
Megachile alpicola	$Nomada \ guttulata$
Megachile apicalis	$Nomada\ hirtipes$
Megachile centuncularis	$Nomada\ lathburiana$
Megachile circumcincta	$Nomada\ leucophthalma$
Megachile ericetorum	Nomada marshamella
Meaachile lianiseca	$Nomada\ miniuscula$
	$Nom a da \ obtus i frons$
Megachile nigriventris	Nomada panzeri
Megachile pilidens	$Nomada\ ruficornis$
Megachile versicolor	Nomada rufipes
Megachile willughbiella	Nomada sexfasciata
Melecta albifrons	Nomada sheppardana
Melitta haemorrhoidalis	Nomada signata
Melitta leporina	$Nomada\ stoeckherti$
Melitta nigricans	Nomada striata
Melitta tricincta	$Nomada\ succincta$
Melitturga clavicornis	Nomada zonata
Nomada alboguttata	$Osmia \ adunca$
Nomada armata	$Osmia\ aurulenta$
	Osmia bicolor
Nomada bifasciata	Osmia bicornis
Nomada castellana	Osmia brevicornis
Nomada fabriciana	Osmia caerulescens
Nomada ferruginata	Osmia cornigera
Nomada flava	Osmia leaiana
Nomada flavoguttata	Osmia parietina
Nomada flavopicta	Osmia spinulosa

 $Osmia\ uncinata$

Panurgus banksianus

 $Panurgus\ calcaratus$

 $Pseudapis \ diversipes$

 $Rhod anthidium\ septemdent atum$

Rophites canus

 $Rophites \ quinque spinos us$

 $Sphecodes \ albilabris$

 $Sphecodes \ alternatus$

Sphecodes crassus

 $Sphecodes\ ephippius$

 $Sphecodes\ ferruginatus$

 $Sphecodes\ geoff rellus$

 $Sphecodes\ gibbus$

 $Sphecodes\ hyalinatus$

 $Sphecodes\ miniatus$

Sphecodes monilicornis

 $Sphecodes\ niger$

 $Sphecodes\ pellucidus$

 $Sphecodes\ rufiventris$

 $Sphecodes\ scabricollis$

 $Sphecodes\ spinulos us$

 $Tetralonia\ macroglossa$

 $Tetraloniella \ alticincta$

Tetraloniella lyncea

 $Tetraloniella\ nana$

 $Tetraloniella\ scabiosae$

 $Trachusa\ by ssina$

 $Xy locopa\ violacea$

Appendix S2 Supplementary Methods, Phylogeny

We used a birth-death polytomy resolver (?) to estimate the placement of missing species given their taxonomic affinities: congeners were constrained to be a sister in a monophyletic clade, unless the phylogenetic tree provided evidence against genus monophyly. Where species did not have congeners in the phylogenetic tree, we used higher-level taxonomic constraints for species placement; we only used such constraints where nodes had greater than 95% bootstrap support. Caenaugochlora, Chlerogella, Pereirapis, Pseudaugochlora, Chalepogenus and Agapostemonoides were restricted to their respective tribes, where monophyly was strongly supported (100% bootstrap support, Hedtke et al., 2013). Note that Agapostemonoides was constrained within the tribe Caenohalictini, which is sometimes considered only a subtribe within the Halictini tribe (Danforth et al., 2008). Pachyprosopis (Euryglossinae: Colletidae) was constrained to be sister to the tribes Euryglossinae, Scrapterinae, and Xeromelissinae, but species were not permitted to enter the clades formed by the Xeromelissinae or Hylaeinae (Almeida & Danforth, 2009; Hedtke et al., 2013). The genus Ceylalictus was constrained to be placed within its subfamily, Nomiodinae. Where synonyms were identified using the ITIS database (taxize package), these were merged (e.g., Homalictus punctatus was synonymised with Lasioglossum punctatus). Where the published phylogeny had species placements that appear very discrepant (i.e., the placement of Ceratina japonica and Anthophora pillipes outside of their otherwise monophyletic groups and placed with fairly distantly related species) and were noted as such by the authors of the tree (Hedtke et al., 2013), these were considered missing species and their placement was estimated using pastis.

For twenty-eight bee clades with missing species (these were usually subfamilies or tribes which had greater than 85% bootstrap support; Table S2.1), a phylogenetic tree was developed using a birth-death model with zero extinction rate and exponential speciation rate using MrBayes, for at least 100,000,000 generations and four runs, with samples taken every 10000 generations. Tracer v1.4.1 was used to track effective sample sizes to assess convergence of parameter estimates. The standard deviation of split frequencies of the four independent runs were also assessed (with a value of less than 0.01 taken as evidence that the models were reaching convergence). From each of the converged runs, we then sub-sampled from the post-burn-in posterior distribution of each bee clade to produce 1000 within-clade trees. A large clade of apid bees did not reach parameter convergence in any of the four independent runs, but measures of phylogenetic signal within the clade were not significantly different between runs (analysis of variance, $F_{df=3} = 1.27$, n.s.), so a random sample from all runs were taken. Random samples (without replacement) were then taken from the set of within-clade trees for each bee clade and were grafted onto the original phylogenetic tree. The original tree had first been rate smoothed, using PATHd8 (with the root age constrained to one) (Britton *et al.*, 2007), which is a computationally efficient methods for large phylogenetic trees, and incomplete clades were pruned. To graft the clades onto the original tree, the clade was first scaled to have a depth of 1; the edge lengths were then scaled by the age of the crown node of the clade.

> Table S2.1: Details of bee clades (subsections of the tree, within each of which the placement of missing species was estimated using pastis (Thomas *et al.*, 2013) and MrBayes (Ronquist *et al.*, 2012)). Percentage bootstrap support for the node is shown for the genus tree from Hedtke *et al.* (2013) unless indicated otherwise. The number of generations run in MrBayes is also provided (some larger clades were run for longer in order to reach convergence).

Family	Clade	Bootstrap support	Generations
			(millions)
Apidae	Meloponini, Bombini, Apini	74	200
Apidae	Euglossini	100	100
Apidae	Centridini (Centris)	100	100
Apidae	Centridini (Epicharis)	100	100
Apidae	Allodapini and Ceratinini	100	100
Apidae	Manuelini	NA 1	100
Apidae	Xylocopini	85^{-2}	100

 $^1\mathrm{No}$ value available as only one species from this tribe is in the original tree

 2 Taken from species-level tree as only one genus is in this clade

Apidae	Epeolini, Brachynomadini,	99	100
	ammobatoidini, Biastini,		
	Townsendiellini, Neolarrini, Nomadini,		
	Hexepeoplini, Ammobatini, Melectini,		
	Caenoprospidini, Ericrocidini,		
	Rhathymini, Esepeolini, Osirini		
	(Epeoloides), Protepeolini, Osirini		
	(Osiris), Tetrapedini (Coelioxoides),		
	Osirini (Parepeolus)		
Apidae	Eucerini, Ancylini, Emphorini,	100	100
	Tapinotaspidini, Exomalopsini,		
	Emphorini		
Apidae	Anthophorini	100	100
Andrenidae	Andreninae	100	100
Andrenidae	Panurginae	99	100
Halictidae	Halictini	97	100
Halictidae	Sphecodini	100	100
Halictidae	Caenohalictini	99	100
Halictidae	Augochlorini	100	100
Halictidae	Nomiinae	100	100
Halictidae	Rophitinae	100	100
Halictidae	Nomiodinae	100	100
Melittidae	Melittidae	98	100
Colettidae	Hylaeinae, Scrapterinae,	97	200
	Euryglossinae, Xeromelissinae		
Colettidae	Colletini	100	100
Colettidae	Neophashaeinae	100	100
Megachilidae	Megachilini	100	100
Megachilidae	Lithurgini	100	100

Megachilidae	Heriades	100	100
Megachilidae	Anthidini (anthidiellum & anthidini)	100	100
Megachilidae	Osmini	100	100

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Appendix S3 Land-Use Intensity Maps

For maps of each land-use class (without land-use intensity), see Hoskins et al. (2016).



Figure S3.1: Percentage of each $1km^2$ grid cell that is low-intensity cropland.



Figure S3.2: Percentage of each $1km^2$ grid cell that is medium-intensity cropland.



Figure S3.3: Percentage of each $1km^2$ grid cell that is high-intensity cropland.

Appendix S4 Supplementary Results

Appendix S4.1 Spatial Autocorrelation Results

Moran's I was used to assess spatial autocorrelation in model residuals (spdep package: Bivand & Piras, 2015; Bivand *et al.*, 2013). There was no significant evidence of spatial autocorrelation in the model residuals for species (Moran's I = -1.06, p = 0.86), functional (Moran's I = -0.94, p = 0.83) or phylogenetic diversity (Moran's I = -0.98, p = 0.83). Spatial autocorrelation was also assessed for the residuals of each study in turn. At most, two studies showed spatial autocorrelation in their residuals, but this was not more than expected by chance (one-sided χ^2 test: $\chi^2 = 5.0294e - 32, p = 0.5$).

Table S4.1: Coefficient estimates (calculated using treatment contrasts in R statistics) and bootstrapped statistics (standard error, bias, confidence intervals) for the model of log-transformed taxonomic diversity. Significance is assumed if the bootstrapped 95% confidence intervals do not cross zero (indicated by significance stars). The first level of the land-use and intensity factor (Natural/semi-natural vegetation) forms part of the intercept term and so does not explicitly appear in the coefficients table.

Coefficient	Original	Standard	bootstrapped	Bias	Lower 95%	Upper 95%	
	estimate	error	Standard		Confidence	Confidence	
			error		Interval	Interval	
Intercept	1.43	0.15	0.16	-0.01	1.14	1.72	*
Pasture	-0.39	0.15	0.16	0.01	-0.68	-0.10	*
Low-intensity cropland	-0.12	0.18	0.18	0.01	-0.47	0.25	
Medium-intensity	-0.51	0.17	0.17	0.01	-0.85	-0.17	*
cropland							
High-intensity cropland	-0.48	0.17	0.17	0.01	-0.82	-0.12	*
Urban	0.07	0.13	0.14	0.00	-0.20	0.33	

Table S4.2: Coefficient estimates (calculated using treatment contrasts in R statistics) and bootstrapped statistics (standard error, bias, confidence intervals) for the model of functional diversity. Significance is assumed if the bootstrapped 95% confidence intervals do not cross zero (indicated by significance stars). The first level of the land-use and intensity factor (Natural/semi-natural vegetation) forms part of the intercept term and so does not explicitly appear in the coefficients table. As log-transformed human population density (HPD) was scaled, the intercept is the mean logged HPD.

Coefficient	Original	Standard	bootstrapped	Bias	Lower 95%	Upper 95%	
	estimate	error	Standard		Confidence	Confidence	
			error		Interval	Interval	
Intercept	1.67	0.08	0.08	-0.00	1.52	1.84	*
Pasture	-0.15	0.08	0.08	-0.00	-0.32	-0.00	*
Low-intensity cropland	0.02	0.10	0.09	-0.00	-0.17	0.21	
Medium-intensity	-0.18	0.09	0.09	0.00	-0.36	-0.02	*
cropland							
High-intensity cropland	-0.17	0.09	0.09	0.00	-0.35	-0.01	*
Urban	-0.02	0.12	0.12	-0.00	-0.25	0.21	
Semi-natural	-0.84	1.18	1.14	0.01	-3.02	1.36	
vegetation: HPD							
Pasture: HPD	1.67	1.80	1.73	0.07	-1.75	5.26	
Low-intensity cropland:	1.86	1.66	1.64	-0.02	-1.32	5.11	
HPD							
Medium-intensity	-3.40	1.62	1.65	-0.05	-6.71	-0.19	*
cropland: HPD							
High-intensity cropland:	1.68	1.51	1.44	-0.02	-1.16	4.75	
HPD							
Urban: HPD	0.11	1.75	1.76	0.01	-3.40	3.58	

Table S4.3: Coefficient estimates (calculated using treatment contrasts in R statistics) and bootstrapped statistics (standard error, bias, confidence intervals) for the model of phylogenetic diversity. Significance is assumed if the bootstrapped 95% confidence intervals do not cross zero (indicated by significance stars). The first level of the land-use and intensity factor (Natural/semi-natural vegetation) forms part of the intercept term and so does not explicitly appear in the coefficients table. As log-transformed human population density (HPD) was scaled, the intercept is the mean logged HPD.

Coefficient	Original	Standard	bootstrapped	Bias	Lower 95%	Upper 95%	
	estimate	error	Standard		Confidence	Confidence	
			error		Interval	Interval	
Intercept	1.50	0.06	0.06	0.00	1.38	1.61	*
Pasture	-0.15	0.06	0.06	0.00	-0.27	-0.02	*
Low-intensity cropland	-0.03	0.07	0.07	0.00	-0.15	0.10	
Medium-intensity	-0.16	0.06	0.06	0.00	-0.29	-0.03	*
cropland							
High-intensity cropland	-0.15	0.06	0.06	0.00	-0.28	-0.03	*
Urban	-0.00	0.08	0.08	0.00	-0.16	0.15	
Semi-natural	-1.00	0.79	0.77	-0.02	-2.44	0.46	
vegetation: HPD							
Pasture: HPD	1.37	1.20	1.24	0.01	-1.03	3.75	
Low-intensity cropland:	1.60	1.10	1.07	0.01	-0.38	3.73	
HPD							
Medium-intensity	-1.44	1.07	1.08	-0.00	-3.63	0.66	
cropland: HPD							
High-intensity cropland:	1.63	1.00	0.96	0.03	-0.23	3.50	
HPD							
Urban: HPD	0.47	1.17	1.11	0.03	-1.69	2.70	



Figure S4.1: Percentage difference in species diversity in different land uses, relative to the natural/semi-natural baseline, for EU27 Countries at a $1 \rm km^2$ resolution.



Figure S4.2: Percentage difference in functional diversity in different land uses, relative to the natural/semi-natural baseline, for EU27 Countries at a $1 \rm km^2$ resolution.



Figure S4.3: Percentage difference in phylogenetic diversity in different land uses, relative to the natural/semi-natural baseline, for EU27 Countries at a 1km^2 resolution.



Figure S4.4: Residuals of a linear model of species diversity against functional diversity (i.e., a model of Fig. S4.1 against Fig. S4.2.



Figure S4.5: Residuals of a linear model of species diversity against phylogenetic diversity (i.e., a model of Fig. S4.1 against Fig. S4.3.



Figure S4.6: Residuals of a linear model of Fig. S4.4 against Fig. S4.5, that is, the difference between functional and phylogenetic diversity once correlations with species diversity are accounted for.

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