Annex I: Macronutrient and organic C content of recovered P-salts from different input materials; all samples given correspond to struvite as the no references were found in literature on elemental composition of other recovered salt phases, and confidential information from the STRUBIAS subgroup was not included in this Table.

input material	dry matter content (%, dried at 105°C)	P	N	Mg	Ca	K	organic C	Reference
				(%, dried at 40°C)				
urban wastewater -Pearl		13.4	5.7					Kraus et al., 2015
urban wastewater - Airpex		11.7	4.7					Kraus et al., 2015
urban wastewater - Stuttgart		10.1	5					Kraus et al., 2015
urban wastewater - Gifhorn								Kraus et al., 2015
urban wastewater	58.3	10.0	2.1	7.3	6.7		3.7	STOWA, 2015
urban wastewater	77.3	7.5	3.0	5.9	4.3		0.3	STOWA, 2015
urban wastewater	52.1	12.1	2.0	8.6	1.6		0.3	STOWA, 2015
urban wastewater	52.8	13.5	5.5	10.8	1.0		0.3	STOWA, 2015
urban wastewater		12.9	5.7	9.8				Ueno and Fuji, 2001
urban wastewater		12.4	5.1	9.1				Munch and Barr, 2001
urban wastewater		12.1	4.2	9.3	0.49	0.06		Vogel et al., 2015
urban wastewater	69.7	9.5	6.0	8.3	0.5	0.14		STRUBIAS - confidential data provider
urban wastewater	61.8	10.5	4.7	7.7	5.6	0.47		STRUBIAS - confidential data provider
urban wastewater	57.1	11.0	5.0	9.5			6.2	ADEME - Naskeo Rittmo Timab, 2016
urban wastewater	61.2	10.9	4.7				6.2	ADEME - Naskeo Rittmo Timab, 2016
manure (Stichting Mestverwerking Gelderland)		5.9	0.8	8.0	1.5	4.8	3.2	Ehlert et al., 2016
manure		10.1	5.8	6.4		3.7		Katanda et al., 2015
urban wastewater		10.4	4.4	13.1	1.2	0.08		Plaza et al., 2007
dairy industry		11.3	3.3	8.64		0.73		Uysal and Kuru, 2015
dairy industry		12.4		4.2	17.9			Massey et al., 2009
potato industry	92	9.4	5.2				48	Sigurnjak et al., 2016
potato industry - Nuresys	56.1	12.8	5.1	9.7			0.25	Vanhoof and Tirez, 2014
food processing (vegetable oil) - Nuresys	55.9	12.6	5.2	9.7			0.1	Vanhoof and Tirez, 2014
urban wastewater - Nuresys	58.4	12.2	5.1	9.1			0.3	Vanhoof and Tirez, 2014
potato industry - Crustell	13.6	10.7	4.7	9.2			3.3	Vanhoof and Tirez, 2014
urban wastewater - Aquafin	56.8	11.5	5.4	9.2			0.4	Vanhoof and Tirez, 2014

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Annex II: Inorganic metal/metalloid contents (mg kg^{-1} dry weight) and Cd/P_2O_5 (mg kg^{-1}) ratios for recovered P-salts (note that confidential information received from the STRUBIAS subgroup was not included in this Table).

input material	As	Cd	Cu	Cr	Hg	Ni	Pb	Zn	Cd/P_2O_5	Reference
	(mg g-1, dry weight)								(mg kg^{-1})	
urban wastewater -Pearl	3	0.1	3	3	0	3	1	15	0.3	Kraus et al., 2015
urban wastewater - Airpex	1	0.3	42	16	0	16	13	90	0.9	Kraus et al., 2015
urban wastewater - Stuttgart	2	0.4	30	4	0	5	7	47	1.9	Kraus et al., 2015
urban wastewater - Gifhorn		0.2	12	2	0	2	1	24	0.8	Kraus et al., 2015
urban wastewater	<0.05	<0.01		<dl	<dl	<dl	<dl		<0.01	Ueno and Fuji, 2001
urban wastewater		<0.4			0		5		<1.6	Munch and Barr, 2001
urban wastewater		<0.4	2	2	0	<0.4	0		<1.6	Antakyali et al., 2006
urban wastewater (unwashed product)	0	0	12	6	0	6	10	42	0.3	STOWA, 2015
urban wastewater (unwashed product)	0	0	5	12	0	6	2	16	0.4	STOWA, 2015
urban wastewater (unwashed product)	0	<0.03	2	3	0	<0.6	1	12	0.1	STOWA, 2016
urban wastewater (unwashed product)	<0.05	<0.6	<1.1	3	<0.01	2	<0.5	2	<1.9	STOWA, 2017
urban wastewater	<1	<0.3	48	8	0	5	11	90	<1.4	STRUBIAS - confidential data provider
urban wastewater	<0.6	<0.3	30	<0.3 (VI)	<0.06	2	6	67	<1.2	STRUBIAS - confidential data provider
urban wastewater		<0.5	2	9	0	1	<0.5	5	<2.0	Weideliner et al., 2005
manure			16					81		Liu et al., 2011
manure (Stichting Mestverwerking Gelderland)	<2	<1	5	2	0	<2	<0.1	59	<7.4	Ehlert et al., 2016
urban wastewater		<0.2	7	4		11	<0.2	19	<0.8	Plaza et al., 2007
dairy industry		<dl	<dl	<dl	<dl	<dl	<dl	<dl	< dl	Uysal and Kuru, 2015
urine	<11	<1.6	89	<1.6		2	<21	224	<5.9	Gell et al., 2011
waste water	<6	<1.1	36	<1	<0.1	<0.5	<16	<15	<4.1	Gell et al., 2011
potato industry	<6	1	42	17		26	7	336	3.6	Abma et al., 2009
potato industry			2					9		Sigurnjak et al., 2016
potato industry - Nuresys	<0.5	<0.12	1	0.5		<0.25	1.0	6	<0.4	Vanhoof and Tirez, 2014
food processing (vegetable oil) - Nuresys	1.4	<0.12	0	0.7		11.0	0.9	5	<0.4	Vanhoof and Tirez, 2014
urban wastewater - Nuresys	<1.25	<0.31	11	1.3		1.2	3.9	22	<1.1	Vanhoof and Tirez, 2014
potato industry - Crustell	0.6	0.9	34	5.9		7.3	2.6	179	3.7	Vanhoof and Tirez, 2014
urban wastewater - Aquafin	<0.5	<0.12	3	1.7		1.3	3.9	28	<0.5	Vanhoof and Tirez, 2014

<dl: below detection limit

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Annex III: Contents of major elements (%, dry basis) for different types of ash-based materials.

	n	Si (%)	Ca (%)	K (%)	P (%)	Al (%)	Mg (%)	Fe (%)	S (%)	Na (%)	Ti (%)	reference
plant biomass												
wood and woody biomass												
Wood ash	1		19.4	3.1	0.2		1.5		0.0			STRUBIAS contribution - confidential data provider
Wood ash	1		24.7	4.8	0.3		2.0		0.1			STRUBIAS contribution - confidential data provider
Wood ash	1		22.8	2.7	0.1		1.3		0.2			STRUBIAS contribution - confidential data provider
Wood ash	1		8.7	2.1	0.1		0.7		0.0			STRUBIAS contribution - confidential data provider
Wood ash	1		8.3	1.7	0.1		0.7		0.0			STRUBIAS contribution - confidential data provider
Wood ash	1		13.1	1.4	0.1		0.8		0.0			STRUBIAS contribution - confidential data provider
Wood ash	1		5.8	1.2	0.1		0.5		0.0			STRUBIAS contribution - confidential data provider
Wood ash	1		9.3	2.0	0.1		0.7		0.1			STRUBIAS contribution - confidential data provider
Wood ash	1		18.5	3.4	0.2		1.4		0.1			STRUBIAS contribution - confidential data provider
Wood ash	1		21.3	2.1	0.1		1.6		0.0			STRUBIAS contribution - confidential data provider
Wood ash	23		18.1	6.1	1.9							STRUBIAS contribution - DK
Alder-fir sawdust #	1	17.5	18.8	5.1	0.9	6.5	2.4	5.7	0.3	1.3	0.6	(Miles et al., 1996)
Balsam bark #	1	12.2	32.5	8.9	2.1	1.0	1.4	1.9	1.1	2.0	0.1	(Bryers, 1996)
Beech bark #	1	5.8	48.4	2.2	1.0	0.1	6.9	0.8	0.3	0.7	0.1	(Bryers, 1996)
Birch bark #	2	2.0	49.0	7.5	1.8	0.3	3.6	1.6	1.1	1.4	0.1	(Bryers, 1996)
Christmas trees #	1	18.6	6.9	6.7	1.1	8.0	1.6	6.7	4.7	0.4	0.2	(Miles et al., 1996)
Elm bark #	1	2.1	59.3	4.5	0.7	0.1	1.5	0.3	0.4	0.6	0.1	(Bryers, 1996)
Eucalyptus bark #	1	4.7	41.0	7.7	1.0	1.6	6.5	0.8	1.4	1.4	0.1	(Theis et al., 2006)
Fir mill residue #	2	9.0	10.7	7.4	1.6	2.7	3.5	5.8	1.5	22.1	0.2	(Bryers, 1996; Thy et al., 2006)
Forest residue #	3	9.6	33.8	8.5	2.2	1.6	4.3	1.0	1.2	1.2	0.2	(Miles et al., 1995; Miles et al., 1996; Zevenhoven-Onderwater et al., 2000)
Hemlock bark #	1	5.2	42.3	4.2	1.0	1.2	8.7	1.0	0.8	0.9	0.1	(Bryers, 1996)
Land clearing wood #	2	30.7	4.1	1.8	0.3	7.9	1.1	3.7	0.1	2.0	0.3	(Miles et al., 1995)
Maple bark #	1	4.2	47.8	5.8	0.3	2.1	4.0	1.0	0.8	1.3	0.1	(Bryers, 1996)
Oak sawdust #	2	14.0	11.0	26.6	0.8	2.3	3.6	2.9	1.5	1.5	0.2	(Miles et al., 1995)
Oak wood #	1	22.8	12.4	7.9	0.8	5.0	0.7	5.9	1.0	0.4	0.1	(Misra et al., 1993; Demirbas, 2004)
Olive wood #	2	4.8	29.4	20.9	4.7	1.1	1.8	0.6	1.1	2.7	0.1	(Vamvuka and Zografos, 2004)
Pine bark #	1	4.3	40.3	6.5	2.2	3.8	3.7	2.0	1.1	1.5	0.1	(Misra et al., 1993; Bryers, 1996)
Pine chips #	1	31.8	5.6	3.7	0.7	3.7	1.5	3.8	0.5	0.9	0.3	(Masia et al., 2007)
Pine pruning #	2	3.6	31.3	18.5	2.5	1.5	6.8	0.9	1.7	0.3	0.1	(Lapuerta et al., 2008)
Pine sawdust #	3	4.5	34.7	11.9	2.7	1.2	8.3	1.5	0.9	0.3	0.1	(Etiegni and Campbell, 1991)
Poplar #	1	1.8	40.7	15.5	0.4	0.4	7.9	0.8	1.5	0.2	0.2	(Misra et al., 1993; Miles et al., 1995)

Poplar bark #	2	0.9	54.9	7.4	1.1	0.3	1.4	0.5	0.3	3.6	0.1	(Bryers, 1996)
Sawdust #	3	12.2	31.3	9.0	1.0	2.4	3.2	1.3	0.8	1.8	0.2	(Tillman, 2000; Wigley et al., 2007)
Spruce bark #	1	2.9	51.4	6.0	1.2	0.4	3.0	1.3	0.8	1.5	0.1	(Bryers, 1996; Demirbas, 2005)
Spruce wood #	1	23.0	12.2	8.0	0.8	5.0	0.7	5.8	1.0	0.4	0.1	(Demirbas, 2005)
Tamarack bark #	11	3.6	38.0	4.7	2.2	4.7	5.4	2.7	1.1	2.5	0.1	(Bryers, 1996)
Willow #	1	2.8	32.7	19.4	5.7	1.0	2.4	0.5	1.2	1.2	0.0	(Miles et al., 1995; Zevenhoven-Onderwater et al., 2000)
Wood	1	10.8	26.5	9.6	1.3	3.0	4.4	2.3	2.0	1.9	0.7	(Wei et al., 2005)
Wood residue	2	24.8	8.3	4.0	0.6	6.7	1.8	4.4	0.8	3.3	0.3	(Miles et al., 1995)
Wood fly ash	1		24.7	5.0	1.3	1.0	2.4	1.6		0.4		(ECN, 2017); biodat_sample_#326
Wood ash	1	27.0	14.2	3.5	0.7	1.6	1.5	1.1		0.4		(ECN, 2017); biodat_sample_#327
Wood bottom ash	1		34.9	8.6	2.2		2.7			0.7		(ECN, 2017); biodat_sample_#328
Wood ash	1		29.0	10.7	2.0		2.5			0.9		(ECN, 2017); biodat_sample_#329
Wood fly ash	1		25.4	8.9	1.9		2.1			0.8		(ECN, 2017); biodat_sample_#330
Wood ash	1	12.0	21.0	7.4	2.4	1.2	2.8	2.0		0.9	0.1	(ECN, 2017); biodat_sample_#331
Wood fly ash	1		16.0	1.1	0.6	1.1	2.1	1.2		0.3		(ECN, 2017); biodat_sample_#332
Wood fly ash	1	19.0	14.0	3.5	0.8	4.0	1.7	2.7		1.5		(ECN, 2017); biodat_sample_#333
Wood fly ash	1	19.0	14.0	4.0	1.0	4.1	1.7	2.5		1.5	0.2	(ECN, 2017); biodat_sample_#334
Wood fly ash	1	3.6	22.0	9.0	1.4	0.9	3.7	1.4		1.0	0.1	(ECN, 2017); biodat_sample_#335
Wood bottom ash	1	5.8	5.7	1.8	0.3	1.0	0.9	0.7		0.4	0.1	(ECN, 2017); biodat_sample_#336
Wood fly ash	1	16.5	18.9	3.8	1.1	4.3	2.2	3.6	1.5	1.2	0.5	(ECN, 2017); biodat_sample_#352
Wood fly ash	1	19.8	14.9	4.5	0.9	5.0	1.5	2.9	1.1	1.5	0.4	(ECN, 2017); biodat_sample_#353
Wood fly ash	1	14.2	19.1	3.6	1.1	4.5	1.6	4.9	1.9	1.3	0.2	(ECN, 2017); biodat_sample_#354
Wood fly ash	1	15.7	17.2	3.0	0.9	4.6	1.4	4.1	1.9	1.0	0.3	(ECN, 2017); biodat_sample_#355
Wood fly ash	1	17.9	16.9	2.9	0.6	4.7	1.6	3.4	2.0	1.2	0.4	(ECN, 2017); biodat_sample_#356
Wood fly ash	1	23.4	12.3	3.8	0.8	4.6	1.5	3.8	0.8	1.1	0.5	(ECN, 2017); biodat_sample_#357
Wood fly ash	1	20.6	13.2	3.4	0.6	5.3	1.6	4.2	1.3	1.2	0.6	(ECN, 2017); biodat_sample_#358
Wood fly ash	1	21.3	12.8	3.7	0.6	5.2	1.5	3.8	1.1	1.2	0.5	(ECN, 2017); biodat_sample_#359
Wood fly ash	1	16.5	17.9	3.9	1.0	4.3	2.1	3.7	1.5	1.2	0.8	(ECN, 2017); biodat_sample_#360
Wood fly ash	1	19.2	16.7	3.8	0.9	4.5	1.9	3.3	1.2	1.3	0.6	(ECN, 2017); biodat_sample_#361
Wood ash	1		21.0	3.8	1.8	1.0	2.9	0.5	0.4	0.3		(ECN, 2017); biodat_sample_#362
Wood fly ash	1	17.1	18.4	3.7	1.1	4.4	2.1	3.4	1.3	1.2	0.5	(ECN, 2017); biodat_sample_#363
Wood fly ash	1	19.9	15.8	4.0	1.0	4.6	1.9	3.3	1.0	1.3	0.4	(ECN, 2017); biodat_sample_#364
Wood fly ash	1	21.6	13.9	4.3	0.8	4.9	1.8	3.1	1.0	1.3	0.4	(ECN, 2017); biodat_sample_#365
Wood fly ash	1	20.3	14.9	4.2	1.0	4.9	1.9	3.4	1.5	1.3	0.4	(ECN, 2017); biodat_sample_#366
Wood fly ash	1	17.1	18.7	3.5	1.0	4.6	2.0	3.4	2.2	1.1	0.4	(ECN, 2017); biodat_sample_#367
Wood fly ash	1	17.1	19.4	3.5	0.9	4.5	1.9	3.4	2.0	1.0	0.4	(ECN, 2017); biodat_sample_#368
Wood ash	1		8.8	5.4	1.3	0.6	1.2	0.4	1.2	0.5		(ECN, 2017); biodat_sample_#369
Wood ash	1		8.1	2.0	0.5	1.7	1.0	2.2	0.2	0.7		(ECN, 2017); biodat_sample_#370

Wood ash	1		9.9	3.6	1.1	0.7	1.2	0.5	0.4	0.4		(ECN, 2017); biodat_sample_#371
Wood ash	1		16.0	7.6	2.3	0.9	2.9	0.6	0.4	0.6		(ECN, 2017); biodat_sample_#372
Wood ash	1		12.0	5.4	1.5	1.0	1.7	0.3	0.7	0.5		(ECN, 2017); biodat_sample_#373
Wood ash	1		13.0	6.2	1.1	2.1	1.6	1.5	1.1	1.0		(ECN, 2017); biodat_sample_#374
Wood ash	1		16.0	5.0	2.0	0.8	2.7	0.5	0.5	0.3		(ECN, 2017); biodat_sample_#375
Wood ash	1		11.0	7.8	1.7	0.8	1.6	0.6	1.6	0.7		(ECN, 2017); biodat_sample_#376
Wood fly ash	1	9.4	22.0	6.1	1.8	0.6	0.9	1.6		0.4		(ECN, 2017); biodat_sample_#377
Wood fly ash	1	11.5	20.3	7.8	2.1	1.8	2.6	0.9	2.7	1.1	0.1	(ECN, 2017); biodat_sample_#378
Wood bottom ash	1	36.1	3.4	2.5	0.3	2.2	0.5	0.5	0.0	0.7	0.0	(ECN, 2017); biodat_sample_#379
Wood fly ash	1	13.0	19.9	6.6	1.9	2.1	2.5	1.1	2.4	1.1	0.3	(ECN, 2017); biodat_sample_#380
Wood bottom ash	1	36.7	3.4	2.3	0.3	2.1	0.5	0.5	0.0	0.6	0.1	(ECN, 2017); biodat_sample_#381
Wood fly ash	1	13.0	18.9	6.6	1.6	2.6	2.3	1.5	2.4	1.2	0.5	(ECN, 2017); biodat_sample_#382
Wood bottom ash	1	36.1	3.3	2.4	0.3	2.3	0.5	0.5	0.0	0.7	0.1	(ECN, 2017); biodat_sample_#383
Wood fly ash	1	14.4	17.8	6.0	1.4	3.0	2.2	1.7	2.1	1.4	0.5	(ECN, 2017); biodat_sample_#384
Wood bottom ash	1	36.5	3.0	2.5	0.2	2.6	0.5	0.6	0.0	0.9	0.1	(ECN, 2017); biodat_sample_#385
Wood fly ash	1	14.4	18.0	5.7	1.3	3.0	2.1	1.8	1.8	1.3	0.6	(ECN, 2017); biodat_sample_#386
Wood bottom ash	1	36.9	3.3	2.6	0.3	2.6	0.5	0.6	0.0	0.9	0.1	(ECN, 2017); biodat_sample_#387
Wood fly ash	1	13.4	17.1	6.8	1.4	2.9	2.3	1.6	2.2	1.5	1.0	(ECN, 2017); biodat_sample_#388
Wood bottom ash	1	35.6	3.6	2.8	0.3	2.8	0.5	0.7	0.0	1.0	0.1	(ECN, 2017); biodat_sample_#389
Wood fly ash	1	15.0	16.4	6.5	1.4	3.1	2.1	1.5	2.1	1.4	0.8	(ECN, 2017); biodat_sample_#390
Wood bottom ash	1	36.3	3.6	3.0	0.3	2.8	0.5	0.6	0.0	0.9	0.1	(ECN, 2017); biodat_sample_#391
Wood fly ash	1	6.7	26.4	7.8	1.9	1.4	2.4	0.8	2.2	0.5	0.1	(ECN, 2017); biodat_sample_#392
Wood fly ash	1	3.7	27.0	8.9	1.9	0.5	1.9	0.3		0.3		(ECN, 2017); biodat_sample_#393
Wood fly ash	1	14.0	15.0	5.0	1.2	1.5	1.3	0.5	1.9	0.6	0.1	(ECN, 2017); biodat_sample_#394
Wood fly ash	1	0.9	25.3	7.6	1.4	1.2	2.2	0.5		1.3	0.0	(ECN, 2017); biodat_sample_#395
Wood fly ash	1	1.3	20.7	8.4	1.2	1.3	1.9	0.4		1.6	0.0	(ECN, 2017); biodat_sample_#396
Wood bottom ash	1	30.0	7.4	7.3	0.3	4.6	1.1	1.4		1.4	0.1	(ECN, 2017); biodat_sample_#397
Wood fly ash	1	21.7	12.4	4.1	0.8	2.1	1.2	0.6	1.6	0.7	0.1	(ECN, 2017); biodat_sample_#398
Wood fly ash	1	8.8	14.0	6.3	1.6	1.4	1.7	0.6	3.4	0.6	0.0	(ECN, 2017); biodat_sample_#399
Wood fly ash	1	14.0	22.0	5.4	1.5	0.7	1.7	0.5	2.7	0.6	0.0	(ECN, 2017); biodat_sample_#400
Wood fly ash	1	11.7	15.9	1.1		7.2	1.3	0.2	2.4	0.3		(ECN, 2017); biodat_sample_#401
Wood fly ash	1	3.8	27.5	5.0	1.3	0.9	1.9	0.6	1.4	0.4		(ECN, 2017); biodat_sample_#402
Wood fly ash	1	17.9	14.6	3.8	0.8	6.1	2.0	4.6		1.4	0.3	(ECN, 2017); biodat_sample_#403
Wood bottom ash	1	30.1	4.6	4.9	0.1	6.6	0.7	2.6		2.1	0.1	(ECN, 2017); biodat_sample_#404
Wood fly ash	1	20.0	8.5	4.1	0.4	6.6	1.2	4.1		1.4	0.3	(ECN, 2017); biodat_sample_#405
Wood bottom ash	1	27.0	7.6	6.0	0.3	6.0	1.0	2.6		1.6	0.2	(ECN, 2017); biodat_sample_#406

Wood fly ash	1	9.1	20.0	4.2	1.2	3.2	2.1	3.9		0.9	0.2	(ECN, 2017); biodat_sample_#407
Wood bottom ash	1	26.0	7.2	5.7	0.3	5.8	0.9	1.7		1.7	0.1	(ECN, 2017); biodat_sample_#408
Wood fly ash	1	13.0	20.0	4.1	1.1	4.0	1.8	5.2		1.2	0.2	(ECN, 2017); biodat_sample_#409
Wood bottom ash	1	30.0	3.3	3.3	0.1	6.7	1.5	3.1		2.2	0.3	(ECN, 2017); biodat_sample_#410
Wood fly ash	1	12.6	20.2	3.8	1.0	4.2	1.9	3.6	2.6	1.2	0.6	(ECN, 2017); biodat_sample_#411
Wood bottom ash	1	31.0	6.3	6.3	0.4	4.0	0.8	1.2		1.4	0.1	(ECN, 2017); biodat_sample_#412
Wood bottom ash	1	34.0	3.5	4.3	0.2	4.5	0.5	1.1		1.6	0.1	(ECN, 2017); biodat_sample_#413
Wood bottom ash	1	32.0	5.5	5.2	0.4	3.9	0.8	1.2		1.2	0.1	(ECN, 2017); biodat_sample_#414
Wood bottom ash	1	31.0	7.4	5.7	0.4	3.7	1.6	1.4		1.1	0.1	(ECN, 2017); biodat_sample_#415
Wood bottom ash	1	29.0	7.1	6.7	0.4	4.8	0.9	1.6		1.5	0.1	(ECN, 2017); biodat_sample_#416
Wood bottom ash	1	28.0	8.5	7.6	0.4	4.3	1.0	1.4		1.5	0.1	(ECN, 2017); biodat_sample_#417
Wood bottom ash	1	30.0	6.9	7.2	0.3	4.4	0.8	1.2		1.4	0.1	(ECN, 2017); biodat_sample_#418
Wood bottom ash	1		8.1	4.5	1.3	0.6	1.0	0.5	0.9	0.6		(ECN, 2017); biodat_sample_#419
Wood bottom ash	1	31.0	6.2	4.9	0.3	4.6	0.8	1.2		1.7	0.1	(ECN, 2017); biodat_sample_#420
Wood fly ash	1	1.0	15.0	24.0	0.9	0.3	2.1	0.5		1.3	0.0	(ECN, 2017); biodat_sample_#421
Wood fly ash	1	0.9	15.0	24.0	0.9	0.3	2.2	0.8		1.2	0.0	(ECN, 2017); biodat_sample_#422
Wood bottom ash	1	8.3	9.0	1.9	0.5	1.0	1.5	1.4		0.3	0.1	(ECN, 2017); biodat_sample_#423
Wood fly ash	1	26.0	7.2	3.0	0.4	4.4	1.0	1.6		1.5	0.4	(ECN, 2017); biodat_sample_#424
Wood fly ash	1	29.0	5.1	7.1	0.3	6.1	0.7	1.4		2.1	0.2	(ECN, 2017); biodat_sample_#425
Wood ash	1	6.2	31.0	4.5	2.5		2.3	0.6		0.3	0.1	(ECN, 2017); biodat_sample_#426
Wood bottom ash	1	25.0	10.0	3.5	0.4	4.5	1.4	1.7		1.3	0.2	(ECN, 2017); biodat_sample_#427
Wood bottom ash	1	27.0	6.7	3.2	0.3	2.2	1.3	1.5		1.2	0.1	(ECN, 2017); biodat_sample_#428
Wood bottom ash	1	31.0	6.4	3.2	0.4	3.5	1.4	1.5		1.1	0.1	(ECN, 2017); biodat_sample_#429
Wood fly ash	1	9.0	24.0	10.0	1.4	2.3	2.6	1.8		0.6	0.1	(ECN, 2017); biodat_sample_#444
Wood fly ash	1	11.0	27.0	5.8	1.0	2.3	2.0	1.4		0.5	0.1	(ECN, 2017); biodat_sample_#445
Wood fly ash	1	12.0	21.0	5.6	1.1	0.9	2.4	1.6		0.6	0.1	(ECN, 2017); biodat_sample_#446
Wood fly ash	1	14.1	18.1	5.9	1.1	2.0	2.7	1.7		0.6	0.1	(ECN, 2017); biodat_sample_#447
Wood fly ash	1		22.1	6.9	1.3		2.4					(ECN, 2017); biodat_sample_#449
Wood fly ash	1		30.2	1.9	1.7		2.6					(ECN, 2017); biodat_sample_#450
Wood fly ash	1		27.1	9.4	2.1		3.4					(ECN, 2017); biodat_sample_#451
Wood fly ash	1		31.2	6.5	1.3		2.1					(ECN, 2017); biodat_sample_#452
Wood fly ash	1		24.1	6.8	1.6		2.7					(ECN, 2017); biodat_sample_#453

Wood fly ash	1	9.3	17.5	4.7	1.0	4.5	1.8	1.2		0.7	0.4	(ECN, 2017); biodat_sample_#454
Wood bottom ash	1	23.0	15.0	4.2	0.7	3.9	1.9	1.8		1.3	0.2	(ECN, 2017); biodat_sample_#455
Wood fly ash	1	5.6	18.0	15.0	1.0	1.7	1.9	1.0		1.6	0.1	(ECN, 2017); biodat_sample_#456
Wood fly ash	1	12.0	18.0	5.0	1.0	2.7	1.8	1.1	1.3	0.7	0.2	(ECN, 2017); biodat_sample_#457
Wood bottom ash	1	25.0	13.0	4.0	0.6	4.6	1.5	1.8	0.1	1.2	0.2	(ECN, 2017); biodat_sample_#458
Wood bottom ash	1	12.0	13.0	3.8	0.7	5.7	1.4	1.3		0.7	0.7	(ECN, 2017); biodat_sample_#459
Wood bottom ash	1	21.5	11.4	3.9	0.6	5.8	1.5	2.1		1.4	0.3	(ECN, 2017); biodat_sample_#460
Wood fly ash	1	21.0	14.0	3.3	0.7	8.4	1.6	2.5		1.1	1.0	(ECN, 2017); biodat_sample_#461
Wood ash	1		24.0	5.9	1.4	2.1		4.3	0.6	0.8		(ECN, 2017); biodat_sample_#462
Wood ash	1		26.1	4.0	2.2	1.1		1.8	0.4	0.5		(ECN, 2017); biodat_sample_#463
Wood ash	1		9.5	3.0	0.7	1.5		2.0	0.3	0.5		(ECN, 2017); biodat_sample_#464
Wood ash	1		8.9	2.4	0.4	1.6		2.1	0.3	0.7		(ECN, 2017); biodat_sample_#465
Wood ash	1		13.0	6.6	1.4	1.6	1.9	1.1	0.5	0.8		(ECN, 2017); biodat_sample_#466
Wood ash	1		5.3	5.4	0.4	1.2	0.8	1.2	1.6	0.8		(ECN, 2017); biodat_sample_#467
Wood bottom ash	1		29.0	4.6	2.7	1.0	2.9	0.6	0.2	0.2		(ECN, 2017); biodat_sample_#468
Wood bottom ash	1		13.0	5.1	1.2	1.3	1.6	1.0	0.4	0.6		(ECN, 2017); biodat_sample_#469
Hemp ash	1	16.0	15.0	6.9	2.2	2.4	1.2	4.5		0.9	0.2	(ECN, 2017); biodat_sample_#470
Hemp ash	1	12.0	20.0	8.9	3.0	1.3	1.2	1.6		0.6	0.1	(ECN, 2017); biodat_sample_#471
Hemp ash	1	12.0	17.0	11.0	2.5	1.2	1.2	1.3		0.6	0.1	(ECN, 2017); biodat_sample_#472
Hemp ash	1	11.0	21.0	10.0	2.4	1.0	1.5	1.2		0.8	0.1	(ECN, 2017); biodat_sample_#473
Hemp ash	1	11.0	22.0	8.4	2.0	1.1	1.3	1.3		0.6	0.1	(ECN, 2017); biodat_sample_#474
mean		*16.6*	*18.2*	*6.2*	*1.2*	*2.9*	*2.1*	*1.9*	*1.2*	*1.2*	*0.2*	*n =204*
median		*14.4*	*16.0*	*5.1*	*1.0*	*2.4*	*1.8*	*1.5*	*1.1*	*1.1*	*0.1*	
minimum		*0.9*	*3.0*	*1.1*	*0.1*	*0.1*	*0.5*	*0.2*	*0.0*	*0.2*	*0.0*	
10th percentile		*3.6*	*5.7*	*2.9*	*0.3*	*0.7*	*0.8*	*0.5*	*0.2*	*0.4*	*0.1*	
90th percentile		*31.0*	*32.6*	*9.1*	*2.2*	*5.7*	*3.5*	*3.9*	*2.2*	*1.6*	*0.5*	
maximum		*36.9*	*59.3*	*26.6*	*5.7*	*8.4*	*8.7*	*6.7*	*4.7*	*22.1*	*1.0*	
coefficient of variation		*0.6*	*0.6*	*0.7*	*0.7*	*0.7*	*0.7*	*0.8*	*0.7*	*1.5*	*1.0*	

grass

Arundo grass #	1	22	2	27	3	0	2	1	2	0	0	(Miles et al., 1995)
Bamboo whole #	1	5	3	44	9	0	4	0	1	0	0	(Scurlock et al., 2000)

Bana grass #	1	18	3	41	1	0	1	1	0	0	0	(Miles et al., 1995)
Buffalo gourd grass #	1	4	10	34	5	1	3	1	4	5	0	(Miles et al., 1995)
Kenaf grass #	1	4	31	16	2	1	5	1	3	1	0	(Miles et al., 1995; Moilanen, 2006)
Miscanthus grass #	4	26	8	16	2	0	2	1	1	0	0	(Miles et al., 1995; Wigley et al., 2007)
Reed canary grass #	1	40	2	2	2	1	1	1	0	0	0	(Moilanen, 2006)
Sorghastrum grass #	1	34	5	7	2	1	1	1	0	0	0	(Miles et al., 1995)
Sweet sorghum grass #	1	31	7	8	2	0	2	0	1	1	0	(Moilanen, 2006)
Switchgrass #	3	31	7	8	2	1	3	1	0	0	0	(Miles et al., 1995)
mean		*21.5*	*8.0*	*20.4*	*2.9*	*0.7*	*2.4*	*0.7*	*1.5*	*0.9*	*0.0*	*n = 15*
median		*24.2*	*6.1*	*16.1*	*1.8*	*0.6*	*1.9*	*0.7*	*1.2*	*0.4*	*0.0*	
minimum		*4.1*	*2.1*	*2.4*	*1.4*	*0.4*	*0.9*	*0.4*	*0.3*	*0.1*	*0.0*	
10th precentile		*4.4*	*2.3*	*6.9*	*1.5*	*0.4*	*1.1*	*0.5*	*0.4*	*0.2*	*0.0*	
90th percentile		*34.7*	*12.6*	*41.1*	*5.2*	*1.2*	*4.1*	*1.0*	*3.3*	*1.7*	*0.1*	
maximum		*39.6*	*31.5*	*44.3*	*8.9*	*1.4*	*5.2*	*1.2*	*4.0*	*4.6*	*0.2*	
coefficient of variation		*0.6*	*1.1*	*0.7*	*0.8*	*0.5*	*0.6*	*0.3*	*0.9*	*1.5*	*1.0*	
straw												
Wheat	1	32.1	5	30.3	2.8	3.6	2.2	0.4	1.4	18.2		(Demirbas, 2004)
Alfalfa #	1	3.7	17.7	31.7	4.6	0.1	8.5	0.3	1.0	1.1	0.0	(Miles et al., 1996)
Barley #	2	23.7	7.0	23.4	1.3	0.4	1.7	0.7	0.9	1.0	0.0	(Risnes et al., 2003)
Corn #	1	23.3	10.5	15.4	1.1	2.7	2.7	1.8	0.7	0.1	0.2	(Masia et al., 2007)
Mint #	1	11.0	12.5	26.6	2.5	2.9	4.1	2.0	1.4	1.5	0.2	(Miles et al., 1996)
Oat #	1	17.6	8.5	22.3	2.7	2.5	2.7	1.5	2.0	0.5	0.1	(Theis et al., 2006)
Rape #	3	19.0	21.8	11.2	1.0	2.9	1.2	1.4	1.1	0.3	0.2	(Masia et al., 2007)
Rice #	2	36.0	1.7	10.4	0.4	0.3	1.6	0.3	0.5	1.3	0.0	(Miles et al., 1996; Thy et al., 2000; Thy et al., 2006)
Unknown	14	26.7	4.8	21.4	1.2	0.4	1.0	0.4	1.6	0.5	0.0	(Wieck-Hansen et al., 2000; Wei et al., 2005)
Wheat	9	23.5	5.8	20.7	1.6	0.8	1.6	0.6	1.7	2.6	0.1	(Miles et al., 1995; Bryers, 1996; Miles et al., 1996; Risnes et al., 2003; Demirbas, 2004; Thy et al., 2006; Nutalapati et al., 2007)
mean		*21.7*	*9.5*	*21.3*	*1.9*	*1.7*	*2.7*	*0.9*	*1.2*	*2.7*	*0.1*	*n = 35*
median		*23.4*	*7.8*	*21.9*	*1.4*	*1.6*	*2.0*	*0.6*	*1.2*	*1.1*	*0.1*	
minimum		*3.7*	*1.7*	*10.4*	*0.4*	*0.1*	*1.0*	*0.3*	*0.5*	*0.1*	*0.0*	
10th precentile		*10.2*	*4.5*	*11.1*	*0.9*	*0.3*	*1.2*	*0.3*	*0.7*	*0.3*	*0.0*	
90th percentile		*32.5*	*18.1*	*30.4*	*3.0*	*3.0*	*4.6*	*1.8*	*1.7*	*4.2*	*0.2*	

maximum		*36.0*	*21.8*	*31.7*	*4.6*	*3.6*	*8.5*	*2.0*	*2.0*	*18.2*	*0.2*	
coefficient of variation		*0.4*	*0.7*	*0.3*	*0.6*	*0.8*	*0.8*	*0.7*	*0.4*	*2.0*	*0.8*	
other residues												
Almond hulls #	1	5.2	6.9	53.0	2.7	1.3	2.4	0.6	0.2	0.8	0.0	(Miles et al., 1996)
Almond shells #	1	7.9	8.2	44.4	2.2	1.6	2.7	1.9	0.4	1.3	0.1	(Miles et al., 1996; Demirbas, 2004)
Coconut shells #	1	31.2	1.7	7.0	0.7	4.5	0.9	4.3	0.0	3.4	0.0	(Miles et al., 1996)
Coffee husks #	1	6.8	9.3	43.5	2.2	3.7	2.6	1.4	0.2	0.5	0.2	(Miles et al., 1996)
Cotton husks #	1	5.1	14.9	41.7	1.8	0.7	4.6	1.3	0.7	1.0	0.0	(Miles et al., 1996)
Grape #	1	4.4	20.2	30.6	3.9	1.4	2.9	1.2	2.5	0.5	0.1	(Lapuerta et al., 2008)
Groundnut shells #	1	12.9	17.6	7.1	1.6	4.4	3.2	7.2	4.2	0.6	0.1	(Miles et al., 1996)
Hazelnut shells #	1	15.7	10.9	25.2	1.4	1.6	4.7	2.7	0.4	1.0	0.1	(Demirbas, 2004)
Mustard husks #	1	8.1	31.3	6.3	0.9	0.8	5.7	0.6	5.9	1.5	0.1	(Werther et al., 2000)
Olive husks #	1	15.3	10.3	3.6	1.1	4.4	2.5	4.4	0.2	19.4	0.2	(Demirbas, 2004)
Olive pits #	2	10.0	14.2	13.6	4.3	3.2	2.3	3.0	0.9	11.7	0.2	(Miles et al., 1996) (Demirbas, 2004)
Olive residue #	1	10.4	9.2	35.5	2.7	2.2	3.5	1.4	1.5	0.1	0.1	(Masia et al., 2007)
Palm fibres-husks #	1	29.5	6.4	7.5	1.2	2.4	2.3	2.7	1.1	0.6	0.1	(Werther et al., 2000)
Palm kernels #	1	8.5	6.6	13.7	13.7	3.3	4.0	6.5	1.0	0.1	0.1	(Masia et al., 2007)
Pepper plant #	1	5.9	22.9	20.4	2.3	2.6	4.4	1.4	3.9	0.7	0.3	(Masia et al., 2007)
Pepper residue #	1	7.2	7.1	29.3	4.9	4.4	2.7	2.4	4.2	0.8	0.1	(Werther et al., 2000)
Pistachio shells #	1	3.9	7.3	15.5	5.3	1.2	2.0	25.4	1.6	3.4	0.1	(Miles et al., 1996)
Plum pits #	5	1.7	10.6	37.8	9.0	0.1	7.1	0.5	1.0	0.3	0.0	(Miles et al., 1996)
Rice husks #	1	44.1	0.7	1.9	0.2	0.1	0.1	0.2	0.4	0.1	0.0	(Bryers, 1996; Miles et al., 1996; Vassilev et al., 2000; Feng et al., 2004; Umantaheswaran and Batra, 2008)
Soya husks #	2	0.9	17.9	29.9	2.5	4.6	5.0	2.1	1.7	4.6	0.1	(Werther et al., 2000)
Sugar cane #	2	21.8	3.5	5.8	1.7	7.7	2.7	7.8	1.4	1.2	1.2	(Miles et al., 1996)
Sunflower husks #	1	11.0	10.9	23.7	3.1	4.6	4.4	3.0	1.6	0.6	0.1	(Werther et al., 2000; Demirbas, 2004)
Walnut blows #	1	3.0	19.6	28.8	4.5	1.2	8.6	0.7	0.9	0.7	0.1	(Miles et al., 1996)
Walnut hulls #	1	3.9	14.2	32.9	3.3	1.5	9.7	1.0	1.1	0.9	0.1	(Miles et al., 1996)
Walnut shells #	1	10.9	11.9	27.4	2.7	1.3	8.1	1.0	0.9	0.7	0.1	(Demirbas, 2004)
mean		*11.4*	*11.8*	*23.4*	*3.2*	*2.6*	*4.0*	*3.4*	*1.5*	*2.3*	*0.1*	*n = 31*
median		*8.1*	*10.6*	*25.2*	*2.5*	*2.2*	*3.2*	*1.9*	*1.0*	*0.8*	*0.1*	
Minimum		*0.9*	*0.7*	*1.9*	*0.2*	*0.1*	*0.1*	*0.2*	*0.0*	*0.1*	*0.0*	

10th percentile		*3.3*	*4.6*	*6.0*	*1.0*	*0.7*	*2.1*	*0.6*	*0.2*	*0.2*	*0.0*	
90th percentile		*26.4*	*20.0*	*42.8*	*5.2*	*4.6*	*7.7*	*6.9*	*4.0*	*4.1*	*0.2*	
Maximum		*44.1*	*31.3*	*53.0*	*13.7*	*7.7*	*9.7*	*25.4*	*5.9*	*19.4*	*1.2*	
coefficient of variation		*0.9*	*0.6*	*0.6*	*0.9*	*0.7*	*0.6*	*1.5*	*1.0*	*1.9*	*1.7*	
unknown plant origin												
unknown plant origin	24			37.8	3.4		4.5		1.8	0.3		STRUBIAS - ECOFI contribution
animal biomass												
poultry manure												
poultry manure	1			21.3	8.2							STTRUBIAS contribution - IE
poultry manure	1	0.9	12.7	5.6	10.4	0.9	7.9	1.5	2.4	1.2	0.0	STRUBIAS contribution - confidential data provider
poultry manure	1		32.2	4.6	4.4			4.4	2.7	1.0		STRUBIAS contribution - confidential data provider
poultry manure	1	2.7	26.5	5.7	7.2	0.5	1.9	0.2	1.7	0.3	0.0	(Masia et al., 2007)
poultry manure	1	1.5	17.4	8.0	10.6	0.4	3.1	0.5	3.1	1.7		STRUBIAS contribution - confidential data provider
poultry manure	?		1.9	10.3			1.0		2.1	5.5		STRUBIAS contribution - ESSP (Kalfos)
poultry manure	415		21.0	14.0	6.7					2.2		STRUBIAS contribution - ESSP (BMC Moerdijk, Billen et al.)
pig manure												
pig manure	1	5.1	11.9	6.4	9.7	0.5	6.6	8.3	4.7	1.3	0.0	STRUBIAS contribution - confidential data provider
pig manure	1	0.9	20.5	23.6	3.6	0.1	1.8	0.9	2.3	1.9	0.0	STRUBIAS contribution - confidential data provider
slaughterhouse waste												
meat and bone meal	1	0.0	29.3	2.6	18.0	1.3	0.8	0.2	1.7	4.7	0.0	(Masia et al., 2007)
meat and bone meal	1	0.0	30.7	2.5	18.4	0.2	0.8	0.5	1.6	2.7	0.0	(Deydier et al., 2005)
meat and bone meal	1	0.2	30.0	1.0	15.0	0.5	0.8		0.3	2.5		STRUBIAS contribution - ESPP
mean		*1.4*	*21.3*	*8.8*	*10.2*	*0.5*	*2.7*	*2.0*	*2.3*	*2.3*	*0.0*	*n = 425*
median		*0.9*	*21.0*	*6.0*	*9.7*	*0.5*	*1.8*	*0.7*	*2.2*	*1.9*	*0.0*	
Minimum		*0.9*	*12.7*	*4.6*	*4.4*	*0.4*	*1.9*	*0.2*	*1.7*	*0.3*	*0.0*	
10th percentile		*0.0*	*11.9*	*2.5*	*4.4*	*0.1*	*0.8*	*0.2*	*1.4*	*1.0*	*0.0*	
90th percentile		*3.4*	*30.7*	*20.6*	*18.0*	*1.0*	*6.9*	*5.6*	*3.3*	*4.7*	*0.0*	
Maximum		*5.1*	*32.2*	*23.6*	*18.4*	*1.3*	*7.9*	*8.3*	*4.7*	*5.5*	*0.0*	
coefficient of variation		*1.2*	*0.5*	*0.8*	*0.5*	*0.7*	*1.0*	*1.4*	*0.5*	*0.7*	*1.3*	
Contaminated biomass												
Sewage sludge (raw)	1	15.5	9.3	1.3	7.0	6.8	1.5	11.0	0.8	1.7	0.5	(Werther et al., 2000)

Sewage sludge (raw)	1	17.9	6.5	1.8	6.8	7.8	1.7	8.7	0.4	1.6	0.5	(Wei et al., 2005)
Sewage sludge (raw)	1	13.2	12.1	0.8	7.2	5.8	1.3	13.2	1.2	1.7	0.5	STRUBIAS contribution - confidential data provider
Sewage sludge (raw)	1	11.3	0.9	0.2	10.6	0.2	0.2	10.7	0.4	0.0		STRUBIAS contribution - confidential data provider
Sewage sludge (raw - DE)	252	12.1	13.8	0.9	7.3	5.2	1.4	9.9	1.5	0.7	0.4	(Krüger and Adam, 2015)
Sewage sludge (post-processed)	1		9.3	1.1	7.7		1.3		2.5			STRUBIAS contribution - ESPP (AshDec process)
slaughterhouse waste and sewage sludge mix	1		28.3	0.3	2.6							STRUBIAS contribution - FEhS
Currency shredded #	1	1.6	10.0	1.8	0.4	7.2	0.9	15.5	4.2	3.0	16.5	(Miles et al., 1995)
Demolition wood #	3	16.9	15.2	5.8	2.2	5.1	2.9	5.1	1.6	2.1	1.0	(Miles et al., 1995; Thy et al., 2000; Masia et al., 2007)
Furniture waste #	1	26.7	9.8	3.1	0.2	6.4	2.0	3.9	0.4	1.7	0.3	(Miles et al., 1995)
Mixed waste paper #	1	13.4	5.4	0.1	0.1	28.3	1.4	0.6	0.7	0.4	2.6	(Miles et al., 1995)
Greenhouse-plastic waste #	1	13.3	18.3	8.1	1.7	2.1	3.4	12.9	1.1	0.6	0.5	(Masia et al., 2007)
Refuse-derived fuel #	1	18.0	19.0	0.2	0.3	7.7	3.9	4.4	1.2	1.0	1.1	(Miles et al., 1995)
Wood yard waste #	1	28.0	17.0	2.5	0.9	1.6	1.3	1.4	1.0	0.7	0.2	(Miles et al., 1995)
municipal solid waste	1	14.2	13.6	5.0	0.1	6.9	1.9	1.7	0.9	5.2		(Demirbas, 2004)
municipal solid waste (UK)	8	0.3	26.0	2.8	0.5	1.5	0.6	0.9	0.5	2.2		(Bogush et al., 2015)
paper industry waste	?		14.8	2.7	0.7							STRUBIAS contribution - CEPI
paper industry waste	391		12.4	2.5	0.2							STRUBIAS contribution - CEPI
mean		*14.5*	*13.4*	*2.3*	*3.1*	*6.6*	*1.7*	*7.1*	*1.2*	*1.6*	*2.2*	
median		*13.8*	*13.0*	*1.8*	*1.3*	*6.1*	*1.4*	*6.9*	*1.0*	*1.6*	*0.5*	*n = 667*
Minimum		*0.3*	*0.9*	*0.1*	*0.1*	*0.2*	*0.2*	*0.6*	*0.4*	*0.0*	*0.2*	
10th percentile		*4.5*	*6.1*	*0.2*	*0.2*	*1.5*	*0.7*	*1.0*	*0.4*	*0.5*	*0.3*	
90th percentile		*24.1*	*21.1*	*5.2*	*7.4*	*7.8*	*3.2*	*13.1*	*2.2*	*2.8*	*2.6*	
Maximum		*28.0*	*28.3*	*8.1*	*10.6*	*28.3*	*3.9*	*15.5*	*4.2*	*5.2*	*16.5*	
coefficient of variation		*0.5*	*0.5*	*0.9*	*1.1*	*1.0*	*0.6*	*0.7*	*0.8*	*0.8*	*2.2*	

Solid fossil fuels

Peat #	1	17.5	7.1	0.9	1.2	10.7	1.3	9.7	4.8	0.1	0.2	(Theis et al., 2006)
Coal #	37	25.2	4.7	1.3	0.2	12.3	1.1	4.8	1.4	0.6	0.6	(Vassilev and Vassileva, 2007; Vassilev and Vassileva, 2009)
Lignite #	5	20.9	9.3	1.2	0.1	9.1	1.5	7.6	3.5	0.4	0.5	(Vassilev and Vassileva, 2007; Vassilev and Vassileva, 2009)
Sub-bituminous #	10	25.5	5.0	1.4	0.0	12.1	1.3	3.7	1.6	0.8	0.6	(Vassilev and Vassileva, 2007; Vassilev and Vassileva, 2009)

Bituminous #	22	26.2	3.5	1.3	0.1	13.1	0.9	4.7	0.9	0.6	0.7	(Vassilev and Vassileva, 2007; Vassilev and Vassileva, 2009)
# values of the oxides are Si, Ca, K, P, Al, Mg, Fe, S, Na and Ti normalised to 100%												
Proposal for the Revised Fertiliser Regulation												
straight inorganic macronutrient fertiliser: the CE product shall contain one of the nutrients in the minimum quantity stated			**8.5**	**5.0**	**5.3**		**3.0**		**4.0**	**0.7**		
compound inorganic macronutrient fertiliser: the CE product shall contain more than one of the nutrients in the minimum quantity stated			**1.1**	**2.5**	**1.3**		**0.9**		**0.6**	**0.7**		

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Annex IV: Inorganic metal and metalloid contents (mg g^{-1}, dry basis) for different types of ash-based materials.

Input material	n	Cd	Cr (total)	Hg	Ni	Pb	As	B	Ba	Be	Co	Cu	Mn	Mo	Sb	Se	Sn	Sr	V	Zn	reference
plant biomass											(mg g^{-1})										
wood and woody biomass																					
Wood bottom ash																					reference
Wood bottom ash	1	2.3	40	0.01	12	16		99	1410		5.1	136	5900						14	446	(ECN, 2017) biodat_sample_#336
Wood bottom ash	1	0.73	102	0.82	59	116	26				14	116	5700						43	430	(ECN, 2017) biodat_sample_#337
Wood bottom ash	1	0.142	32.7		4	8.1			757		2.72	33.9	3990					229	8.66	697	(ECN, 2017) biodat_sample_#379
Wood bottom ash	1		40.1		4.57	9.07	6.13		781		3.43	48.2	4360					228	11.6	799	(ECN, 2017) biodat_sample_#381
Wood bottom ash	1		64.2		3.71	10.6	18.3		833		3.63	63.2	4040					227	8.77	985	(ECN, 2017) biodat_sample_#383
Wood bottom ash	1		47.4		3.2	12.7	14.7		832	0.542	3.11	50.7	3690					222	10.4	971	(ECN, 2017) biodat_sample_#385
Wood bottom ash	1		61.8		4.95	13.5	20.8		881		3.74	77.2	3920					235	9.28	1160	(ECN, 2017) biodat_sample_#387
Wood bottom ash	1		62		5.22	19.5	17.7		971		4.62	58	3940					255	10.4	1210	(ECN, 2017) biodat_sample_#389
Wood bottom ash	1	0.143	71.9		6.89	17	72.1		929	0.608	5.14	96.6	3530					254	10.2	1340	(ECN, 2017) biodat_sample_#391
Wood bottom ash	1		59		11	72	3.4	7.2	1510		7.8	56	3600						20	1240	(ECN, 2017) biodat_sample_#397
Wood bottom ash	1		50		19	14		26	1130		7	47	1900						33	856	(ECN, 2017) biodat_sample_#404
Wood bottom ash	1		54	0.01	28	13	7.5	76	1990		9.4	77	3000						40	1630	(ECN, 2017) biodat_sample_#406
Wood bottom ash	1		42		18	12		74	1770		6.5	62	3500						27	1330	(ECN, 2017) biodat_sample_#408
Wood bottom ash	1		118		65	19	11	13	763		14	28	900						74	606	(ECN, 2017) biodat_sample_#410
Wood bottom ash	1	0.15	30		11	12		72	1490		5.1	51	3600						15	1850	(ECN, 2017) biodat_sample_#412
Wood bottom ash	1	0.12	15		12	15		34	1040		4.2	28	1700						12	427	(ECN, 2017) biodat_sample_#413
Wood bottom ash	1		40		17	8.7		72	1270		26	47	2600						20	893	(ECN, 2017) biodat_sample_#414
Wood bottom ash	1	0.29	91		62	11	62	81	1420		20	45	2900						18	1070	(ECN, 2017) biodat_sample_#415
Wood bottom ash	1	0.14	22		9.6	9.8	5	55	1290		6.4	71	2800						20	1300	(ECN, 2017) biodat_sample_#416
Wood bottom ash	1	0.13	37					64	1600		13	64	3200						22	1430	(ECN, 2017) biodat_sample_#417
Wood bottom ash	1	0.56	16		10	13		58	1300		5.8	67	3100						18	1180	(ECN, 2017) biodat_sample_#418
Wood bottom ash	1	15	50	0.35	12	97	7.1	200			5.1	110	9000						6.9	2900	(ECN, 2017) biodat_sample_#419
Wood bottom ash	1	0.46	43		9.2	8.5		87	1470		5.3	36	3800						20	1170	(ECN, 2017) biodat_sample_#420
Wood bottom ash	1	0.48	71		17	8.2		98	1150		6.8	62	7100						18	106	(ECN, 2017) biodat_sample_#423
Wood bottom ash	1	0.52	37		15	20	3	51	1200		7.6	39	4100						30	190	(ECN, 2017) biodat_sample_#427
Wood bottom ash	1		120		31	21		40	1200		6.3	36	4400	4.6					17	240	(ECN, 2017) biodat_sample_#428
Wood bottom ash	1		360		53	12		43	1100		6	36	4000	7					19	270	(ECN, 2017) biodat_sample_#429
Wood bottom ash	1	0.83	130		34	19	8.8				7.9	230	5400						26	380	(ECN, 2017) biodat_sample_#430
Wood bottom ash	1		62		22	27	4				9.1	60	7600						18	400	(ECN, 2017) biodat_sample_#431
Wood bottom ash	1	1.1	78	0.046	32	50					7.3	530	4100						20	370	(ECN, 2017) biodat_sample_#432
Wood bottom ash	1	1	53	0.045	30	14					11	70							18	380	(ECN, 2017) biodat_sample_#433
Wood bottom ash	1	4.9	49		18	45					10	59	7300						28	730	(ECN, 2017) biodat_sample_#434
Wood bottom ash	1		91		33	7.6	12				7.3	38	2800						52	110	(ECN, 2017) biodat_sample_#435
Wood bottom ash	1		63		19	16	3.9				8.7	36	5700						34	140	(ECN, 2017) biodat_sample_#436

Wood bottom ash	1	0.76	78		39	19					8	62	4900			23	240	(ECN, 2017) biodat_sample_#437
Wood bottom ash	1		49		20	10					5.1	52	6800			15	210	(ECN, 2017) biodat_sample_#438
Wood bottom ash	1	0.56	39		22	10					5.8	40	4600			20	170	(ECN, 2017) biodat_sample_#439
Wood bottom ash	1	0.67	30		34	6.2					7.6	73	3900			9.3	230	(ECN, 2017) biodat_sample_#440
Wood bottom ash	1	1	36		21	9.1	4.1				6.9	48	5200			16	190	(ECN, 2017) biodat_sample_#441
Wood bottom ash	1	0.92	39		20	10					7.1	50	6300			20	210	(ECN, 2017) biodat_sample_#442
Wood bottom ash	1	0.88	30		18	7.1					6.4	42	5100			14	140	(ECN, 2017) biodat_sample_#443
Wood bottom ash	1	0.73	80	0.02	39	37		135	1670		9.3	62	5000			26	719	(ECN, 2017) biodat_sample_#455
Wood bottom ash	1	0.46	72		39	60	3.4	107			13	50	5000			29	257	(ECN, 2017) biodat_sample_#458
Wood bottom ash	1	9.9	109	0.04	55	43		192	1060		7.5	76	4900			33	2230	(ECN, 2017) biodat_sample_#459
Wood bottom ash	1	0.14	67		35	56		91	1360		9.1	62	5300			33	155	(ECN, 2017) biodat_sample_#460
Wood bottom ash	1	1.4	24	0.02	25	19		330			4.9	150	7600			10	840	(ECN, 2017) biodat_sample_#468
Wood bottom ash	1	6.5	47	0.69	13	70	6	160			7.2	110	13000			15	1900	(ECN, 2017) biodat_sample_#469
mean		***1.8***	***64***	***0.2***	***23***	***24***	***15***	***91***	***1221***	***0.6***	***7.8***	***75***	***4669***	***5.8***	***236***	***21.6***	***781***	*n =62*
median		***0.7***	***50***	***0.0***	***19***	***14***	***8***	***74***	***1200***	***0.6***	***7.0***	***59***	***4100***	***5.8***	***229***	***19.0***	***697***	
minimum		***0.1***	***15***	***0.0***	***3***	***6***	***3***	***7***	***757***	***0.5***	***2.7***	***28***	***900***	***4.6***	***222***	***6.9***	***106***	
10th precentile		***0.1***	***30***	***0.0***	***5***	***8***	***3***	***29***	***817***	***0.5***	***4.0***	***36***	***2800***	***4.8***	***225***	***9.7***	***164***	
90th percentile		***5.1***	***105***	***0.7***	***46***	***58***	***26***	***179***	***1621***	***0.6***	***13.0***	***112***	***7200***	***6.8***	***254***	***33.4***	***1510***	
maximum		***15.0***	***360***	***0.8***	***65***	***116***	***72***	***330***	***1990***	***0.6***	***26.0***	***530***	***13000***	***7.0***	***255***	***74.0***	***2900***	
coefficient of variation		***1.9***	***0.8***	***1.5***	***0.7***	***1.0***	***1.2***	***0.8***	***0.3***	***0.1***	***0.5***	***1.0***	***0.4***	***0.3***	***0.1***	***0.6***	***0.8***	
Wood fly ash																		
Wood fly ash	1	34	35	0.26	30	34	11	404	109		16	133	15200	4.6		17	3660	(ECN, 2017) biodat_sample_#326
Wood fly ash	1	6.7	13	0.33	13	42	4.7	151			6.3	48	8400	1.1		35	530	(ECN, 2017) biodat_sample_#332
Wood fly ash	1	8.3	49	0.37	23	91	29	171	2060		11	76	7700			45	1120	(ECN, 2017) biodat_sample_#333
Wood fly ash	1	10	56	0.36	31	91	17	222	2090		13	81	7800			43	1370	(ECN, 2017) biodat_sample_#334
Wood fly ash	1	26	73	0.22	35	209	22	480	3970		13	226	23000			16	3420	(ECN, 2017) biodat_sample_#335
Wood fly ash	1	5.95	136	0.815	58.7	171	34.6	141	1900	1.18	19.9	137	10000	7.51	613	76.3	1900	(ECN, 2017) biodat_sample_#352
Wood fly ash	1	4.6	104	0.309	33.2	108	53.2	140	1620	1.81	13	121	7100	14.2	589	48.1	1330	(ECN, 2017) biodat_sample_#353
Wood fly ash	1	5.93	56	0.742	52	124	45.6	191	1860	1.79	17.3	82.8	8300	12.6	555	38.3	1600	(ECN, 2017) biodat_sample_#354
Wood fly ash	1	4.75	78.1	0.57	51.2	225	44.3	144	1430	2.17	13.5	106	4700	11.5	538	55.5	1670	(ECN, 2017) biodat_sample_#355
Wood fly ash	1	4.97	119	0.47	44.9	221	215	151	1460	1.51	10.1	135	4500	6.01	471	61	1570	(ECN, 2017) biodat_sample_#356
Wood fly ash	1	4.43	178	0.563	47.6	218	83.2	153	1910	1.3	15.2	193	5900	7.62	483	71.6	2530	(ECN, 2017) biodat_sample_#357
Wood fly ash	1	5.93	232	0.512	68.9	355	90.4		1620	1.59	26.7	205	4900	11	451	75.7	2590	(ECN, 2017) biodat_sample_#358
Wood fly ash	1	5.13	172	0.453	63.2	257	60.7	154	1500	1.6	22.8	160	5100	8.17	449	66.6	1940	(ECN, 2017) biodat_sample_#359
Wood fly ash	1	7.5	149	0.818	56.6	245	48.5	144	2060	1.16	19.8	168	9700	8.95	615	70.5	2400	(ECN, 2017) biodat_sample_#360
Wood fly ash	1	5.76	129	0.821	53.3	184	33.6	97.2	1720	1.23	18.9	134	8200	6.28	549	71.1	1790	(ECN, 2017) biodat_sample_#361
Wood fly ash	1	5.82	112	0.737	59.1	170	32.2	135	1830	1.11	21.2	122	10100	6.48	598	72.8	1710	(ECN, 2017) biodat_sample_#363
Wood fly ash	1	5.46	99.2	0.441	50.1	131	20.3	96.3	1700	1.22	17.9	98.7	9300	6	542	70.9	1500	(ECN, 2017) biodat_sample_#364
Wood fly ash	1	4.33	88.3	0.484	48	101	17.2	70.6	1540	1.38	17	81.4	8200	6	498	72.3	1300	(ECN, 2017) biodat_sample_#365
Wood fly ash	1	4.73	99.7	1.38	60.7	124	19.4	117	1630	1.36	19.3	125	9900	6.96	520	72.8	1590	(ECN, 2017) biodat_sample_#366

Wood fly ash	1	6.17	106	0.822	62.7	191	27.9	183	1690	1.34	20.5	155	10100	8.18			588	77.5	1960	(ECN, 2017) biodat_sample_#367
Wood fly ash	1	5.32	95.4	0.8	61.6	143	27.2	161	1720	1.29	38.1	125	9000	7.52			583	74.8	1320	(ECN, 2017) biodat_sample_#368
Wood fly ash	1	13	28	0.95	63	71	4.4	800	2300		7.8	360	24400					20	4300	(ECN, 2017) biodat_sample_#377
Wood fly ash	1	17.9	57.4	1.07	45.2	258	12		2600		13.1	137	29000				974	39.2	3100	(ECN, 2017) biodat_sample_#378
Wood fly ash	1	22.1	144	1.21	60.3	386	88.2		2680		16.4	207	29400	6.41			930	36.6	4120	(ECN, 2017) biodat_sample_#380
Wood fly ash	1	22	291	0.769	55.6	573	176		3490		19.1	315	26600	9.69			895	37.8	5810	(ECN, 2017) biodat_sample_#382
Wood fly ash	1	21	225	0.906	60.5	510	115		3110		18.8	264	26700	6.69			866	40.4	4410	(ECN, 2017) biodat_sample_#384
Wood fly ash	1	17.1	266	0.939	54.3	616	160		3160		19.3	301	23400	7.19			795	39.3	5870	(ECN, 2017) biodat_sample_#386
Wood fly ash	1	19.3	252	0.856	58.6	709	139		3960		24.8	315	20100	8.8			845	39.2	5900	(ECN, 2017) biodat_sample_#388
Wood fly ash	1	16.4	272	0.992	68.2	688	156		3360		21.7	302	17500	7.64			809	35.2	5120	(ECN, 2017) biodat_sample_#390
Wood fly ash	1	18	45.8	0.848	33.5	105	39.2		3700		10.4	111	28500				956	27.2	4720	(ECN, 2017) biodat_sample_#392
Wood fly ash	1	14	12	0.63	25	88	5.2		2800		10	130	17000			2.1		15	2900	(ECN, 2017) biodat_sample_#393
Wood fly ash	1	10	28	0.35	11	58	8.4	190	1700		5	56	9300	2.9				12	2000	(ECN, 2017) biodat_sample_#394
Wood fly ash	1	7.53	45.5	0.602	75.1	32.9	8.21		2460		8.09	93.1	13000				836	31.2	3330	(ECN, 2017) biodat_sample_#395
Wood fly ash	1	6.61	47.4	0.663	122	33	6		2360		10.6	78	11800				757	72.7	2960	(ECN, 2017) biodat_sample_#396
Wood fly ash	1	6.8	37	0.34	13	52	4.2	130	1400		4.1	52	7100	3				11	1100	(ECN, 2017) biodat_sample_#398
Wood fly ash	1	12	56	0.21	24	74	5.1	200	1900		8.6	120	13000	4.9				14	2700	(ECN, 2017) biodat_sample_#399
Wood fly ash	1	9.4	23	0.46	22	82		650	2100		5.3	76	15000	3				11	2400	(ECN, 2017) biodat_sample_#400
Wood fly ash	1	11	22	0.45	24	110	4.3	480	1700		6.4	91	9900	4.7				14	1900	(ECN, 2017) biodat_sample_#401
Wood fly ash	1	9.5	32	0.28	25	64		260	2400		6.3	96	17100					12	2800	(ECN, 2017) biodat_sample_#402
Wood fly ash	1	6	113	0.62	97	61	21	174	1560		21	130	6700	12.5				90	1060	(ECN, 2017) biodat_sample_#403
Wood fly ash	1	1.6	88	0.2	74	38	15	72	1240		14	150	2700	7.3				89	1050	(ECN, 2017) biodat_sample_#405
Wood fly ash	1	9.2	109	1.1	77	105	29	313	2320		17	180	8700	11				50	2290	(ECN, 2017) biodat_sample_#407
Wood fly ash	1	7.9	71	1.1	84	85	48	205	1930		19	90	7500	11				48	1610	(ECN, 2017) biodat_sample_#409
Wood fly ash	1	10	464	2.51	69.8	514	148	249	2000	0.883	20.5	352	10500	13.1			636	74.3	3280	(ECN, 2017) biodat_sample_#411
Wood fly ash	1	69	251	0.42	23	234	9.4	428	1830		8.2	894	14000					5.8	13300	(ECN, 2017) biodat_sample_#421
Wood fly ash	1	75	144	0.24	27	226	23	372	1930		10	794	15000	11				8.5	13800	(ECN, 2017) biodat_sample_#422
Wood fly ash	1	6.9	147	0.31	33	462	86	115	1750		9.2	375	3200					28	2540	(ECN, 2017) biodat_sample_#424
Wood fly ash	1		155	0.01	15	76	54	45	1730		5.2	367	2200					21	3310	(ECN, 2017) biodat_sample_#425
Wood fly ash	1	24	61	0.61	41	130	14	370	2100		14	140	9700	8.1	2.5			37	5900	(ECN, 2017) biodat_sample_#444
Wood fly ash	1	16	54	0.55	27	94	9.4	320	1700		11	95	7900	4.5				28	2800	(ECN, 2017) biodat_sample_#445
Wood fly ash	1	19	140	0.27	48	82	13	260	2100		12	110	9100	17				29	2700	(ECN, 2017) biodat_sample_#446
Wood fly ash	1	24	160	0.24	67	91	10	310	2100		11	120	9600	27				27	3400	(ECN, 2017) biodat_sample_#447
Wood fly ash	1	6.8	57		36	33	8.7				8.3	72	6500					25	980	(ECN, 2017) biodat_sample_#448
Wood fly ash	1	27	150	0.39	49	90	17	330				120						32	4100	(ECN, 2017) biodat_sample_#449
Wood fly ash	1	29	44	0.21	20	75	7.5	370				130						13	5300	(ECN, 2017) biodat_sample_#450
Wood fly ash	1	32	69	0.18	31	69	5.9	400				120						23	3000	(ECN, 2017) biodat_sample_#451
Wood fly ash	1	32	26	0.13	31	68		450				150						15	7000	(ECN, 2017) biodat_sample_#452
Wood fly ash	1	26	44	0.28	23	37	13	440				140						16	7800	(ECN, 2017) biodat_sample_#453
Wood fly ash	1	14	109	0.17	78	67		264	1500		10	109	7700					36	3360	(ECN, 2017) biodat_sample_#454
Wood fly ash	1	24	96	0.06	94	152	7.8	439	1820		10	158	6600	17				39	16500	(ECN, 2017) biodat_sample_#456

Wood fly ash	1	12	92		67	52	3.9	320			10	84	7100						25	3310	(ECN, 2017) biodat_sample_#457
Wood fly ash	1		155		60	10		127	1320		10	67	5200	8.3					49	388	(ECN, 2017) biodat_sample_#461
mean		***14.9***	***110.7***	***0.6***	***49***	***174***	***42***	***257***	***2065***	***1.4***	***14***	***174***	***11681***	***8.6***	***2.5***	***2.1***		***664***	***41***	***3436***	*n =104*
median		***10.0***	***95.7***	***0.5***	***50***	***105***	***21***	***200***	***1900***	***1.3***	***13***	***130***	***9300***	***7.6***	***2.5***	***2.1***		***598***	***37***	***2700***	
minimum		***1.6***	***12.0***	***0.0***	***11***	***10***	***4***	***45***	***109***	***0.9***	***4***	***48***	***2200***	***1.1***	***2.5***	***2.1***		***449***	***6***	***388***	
10th precentile		***4.9***	***28.4***	***0.2***	***23***	***38***	***5***	***111***	***1472***	***1.1***	***6***	***76***	***5020***	***4.5***	***2.5***	***2.1***		***478***	***13***	***1138***	
90th percentile		***27.2***	***231.3***	***1.0***	***75***	***454***	***125***	***442***	***3145***	***1.8***	***21***	***315***	***23800***	***13.1***	***2.5***	***2.1***		***909***	***74***	***5897***	
maximum		***75.0***	***464.0***	***2.5***	***122***	***709***	***215***	***800***	***3970***	***2.2***	***38***	***894***	***29400***	***27.0***	***2.5***	***2.1***		***974***	***90***	***16500***	
coefficient of variation		***0.9***	***0.8***	***0.7***	***0.5***	***1.0***	***1.2***	***0.6***	***0.3***	***0.2***	***0.5***	***0.9***	***0.6***	***0.5***				***0.3***	***0.6***	***0.9***	
Wood (unknown)																					
Wood ash	1	3.5	91	0.006	39	6.5	3.2	102	779		9.7	58	9050	5.7					16	497	(ECN, 2017) biodat_sample_#327
Wood ash	1	14	160	0.29	79	120	4.7	360	2300		11	170	18000	9.6					30	2100	(ECN, 2017) biodat_sample_#331
Wood ash	1	3.3	39	0.012	17	26	1.8	220			7.1	100	9400						14	870	(ECN, 2017) biodat_sample_#362
Wood ash	1	12	29	1.1	14	80	8	220			4.1	100	11000						12	2300	(ECN, 2017) biodat_sample_#369
Wood ash	1	11	26	0.47	17	36		110			11	59	5000						34	1500	(ECN, 2017) biodat_sample_#370
Wood ash	1	2.2	31	0.08	13	17	3.2	200			5.1	68	7800						13	770	(ECN, 2017) biodat_sample_#371
Wood ash	1	5.8	41	0.36	25	59	2.5	340			8.2	160	22000						20	1900	(ECN, 2017) biodat_sample_#372
Wood ash	1	5.3	24	0.37	15	49	2.8	240			5.9	110	13000						11	1300	(ECN, 2017) biodat_sample_#373
Wood ash	1	15	49	0.43	21	120	4.2	210			13	120	9800						28	3400	(ECN, 2017) biodat_sample_#374
Wood ash	1	4.3	41	0.27	16	44		200			5.1	180	17000						13	1500	(ECN, 2017) biodat_sample_#375
Wood ash	1	21	44	0.97	20	200	5.8	190			6.4	230	15000						13	5600	(ECN, 2017) biodat_sample_#376
Wood ash	1	2.3	10		20	17	6	260	2300		7.2	110	8100	3.2					7.9	210	(ECN, 2017) biodat_sample_#426
Wood ash	1	11	39	0.08	47	47					18	140	21000								(ECN, 2017) biodat_sample_#462
Wood ash	1	12	29	0.163	28	45					11	134	14200								(ECN, 2017) biodat_sample_#463
Wood ash	1	4.9	21	0.25	12	39					6.9	58	7400								(ECN, 2017) biodat_sample_#464
Wood ash	1	6.5	23	0.28	13	60					7.5	72	5600								(ECN, 2017) biodat_sample_#465
Wood ash	1	6.5	40	0.43	14	59					5.9	130	11000								(ECN, 2017) biodat_sample_#466
Wood ash	1	11	22	0.38	12	60					6.8	53	4140								(ECN, 2017) biodat_sample_#467
Wood (unknown)	1	6.2			100.6	5.7	18.3		2324	1.1	13	193	23562		0.78	0.9	1.6	2178	37.1	1086	(Thy et al., 2008)
Wood (unknown)	1	4.5			99	2.9	10.7		2476	1.2	14	215	26451		0.79	0.4	1.6	2692	36.1	1112	(Thy et al., 2008)
Wood (unknown)	1	2.1			103.5	0.3	17.8		2604	1.1	14	201	26039		0.82	0.9	1.6	2450	40.9	1172	(Thy et al., 2008)
Wood (unknown)	1	7.1			85.1	1.8	17.5		2390	1.0	10	183	22215		0.92	1	1.4	2263	35.2	997	(Thy et al., 2008)
Wood (unknown)	1	7.5			71.2	4.9	13.6		1811	1.0	9	166	19745		0.78	1.2	1.2	2116	30.2	870	(Thy et al., 2008)
Wood (unknown)	1	7.5			92	9.5	16.5		2201	1.0	9	162	17799		0.66	1.1	1.1	2128	30.5	806	(Thy et al., 2008)
Wood (unknown)	1	8.9			72.8	12.2	19.4		2380	1.1	10	197	22063		0.71	1.3	1.3	2382	35.8	992	(Thy et al., 2008)
Wood (unknown)	1	8.4			61.5	10.3	17.8		2098	1.1	9	176	19581		0.67	1	1.1	2110	32.3	968	(Thy et al., 2008)
Wood (unknown)	1	7.8			64.3	11.3	18.6		2219	1.0	9	171	17937		0.6	1.2	1.2	2086	32.5	875	(Thy et al., 2008)
Wood (unknown)	1	7.5			59.6	10.7	17.6		2210	1.0	8	160	17731		0.57	0.7	1.1	2095	30.8	812	(Thy et al., 2008)
Wood (unknown)	1	5.9			43.1	8.6	9.6		1731	1.0	6	117	13298		1.27		0.9	1844	21.1	603	(Thy et al., 2008)
Balsam bark	1												20160								(Bryers, 1996)

beech wood	1	16.6	76.2	1.1	34.6	325	16.9		9.6	358	90.5	15.7	63.5	85.8	78.9	23.6		(Demirbas, 2005)
Beech bark	1										3100							(Bryers, 1996)
Birch bark	2										22870							(Bryers, 1996)
Elm bark	1										775							(Bryers, 1996)
Eucalyptus bark	1										10850							(Theis et al., 2006)
Fir mill residue	2										13640							(Miles et al., 1995) (Thy et al., 2008)
Forest residue	3										13180							(Miles et al., 1995; Miles et al., 1996; Zeven
Hemlock bark	1										9300							(Bryers, 1996)
Maple bark	2										5430							(Bryers, 1996)
Oak wood	2										14900							(Misra et al., 1993; Demirbas, 2004)
Pine bark	2										12400							(Bryers, 1996; Moilanen, 2006)
Pine chips	1							558.0			2090						1495.0	(Masia et al., 2007)
Pine sawdust	2										10550							(Etiegni and Campbell, 1991; Moilanen, 200
Poplar	3										4500							(Misra et al., 1993; Miles et al., 1995)
Poplar bark	1										2330							(Bryers, 1996)
Sawdust	2										27910							(Tillman, 2000; Wigley et al., 2007)
Spruce bark	1										13950							(Demirbas, 2005)
Tamarack bark	1										26360							(Bryers, 1996)
Wood (unknown)	1										35740							(Wei et al., 2005)
Wood (unknown)	1																	(Zevenhoven et al., 2012)
Wood (unknown)	1										98							(Zevenhoven et al., 2012)
Wood (unknown)	1										100							(Zevenhoven et al., 2012)
Wood (unknown)	1										0							(Zevenhoven et al., 2012)
Wood (unknown)	1										87							(Zevenhoven et al., 2012)
Wood (unknown)	1										167							(Zevenhoven et al., 2012)
Wood (unknown)	1										92							(Zevenhoven et al., 2012)
Wood (unknown)	1										166							(Zevenhoven et al., 2012)
Wood (unknown)	1										112							(Zevenhoven et al., 2012)
Wood (unknown)	1										26							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										270							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										164							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										408							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										545							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										440							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										440							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										370							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										290							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										300							(Zevenhoven et al., 2012)
Forest residue (unknown)	1										330							(Zevenhoven et al., 2012)
Forest residue (fly ash)	1	25.0	290.0	1.7	47.0	76.0	4.0	4260.0	13.0	200	20000					39.0	3630.0	(Pöykiö et al., 2014)
Forest residue (bootom ash)	1	5.7	318.0		36.0	29.0	14.0	2210.0	11.0	196.0	15600					41.0	950.0	(Pöykiö et al., 2009)

Forest residue fly-ash (sawdust and bark)	1	19	92	0.8	31.0	352	19	263	484	39	11	8400	24.0	10.0	284	36		(Lanzerstorfer, 2015)
Forest residue fly-ash (chips; 80% softwood)	1	105	76	0.1	23.0	602	36	221	91	39	140	4100	43.0	12.0	242	38		(Lanzerstorfer, 2015)
Forest residue fly-ash (chips; 80% softwood)	1	41	87	1.7	27.0	250	27	671	191	25	145	14600	5.0	10.0	641	10		(Lanzerstorfer, 2015)
Forest residue fly ash (chips; 90% softwood)	1	77	70	4.2	4.0	892	62	292	136	25	156	6800	5.0	10.0	283	10		(Lanzerstorfer, 2015)
Forest residue fly-ash (rubber tree; 95% chips, 5% bark)	1	9	15	0.1	31.0	53	15	227	357	34	5	2900	27.0	10.0	461	30		(Lanzerstorfer, 2015)
Forest residue fly-ash (90% chips, 10% horse dung)	1	32	41	0.1	6.0	228	19	114	144	34	5	1000	32.0	11.0	141	10		(Lanzerstorfer, 2015)
Wood bark (unknown)	1											274						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											300						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											0						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											4210						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											1630						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											99						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											500						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											550						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											270						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											530						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											470						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											290						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											202						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											428						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											532						(Zevenhoven et al., 2012)
Wood bark (unknown)	1											465						(Zevenhoven et al., 2012)
bark, sawdust and offcuts	1		38.8	0.5	74.0	160	7.4	438.0	2600	17	144	11040		4	741	24	9100	(Kröppl et al., 2011)
bark, trimmings and offcuts, left over wood, sawdust	1		33.2	2.9	81.5	213	32.8	194.0	1400	9	100	10900		1	516	28	4100	(Kröppl et al., 2011)
raw wood	1		5.0	0.9	15.8	13.7	5.0	20.0	275.0	5.0	5.0	2000.0		1.0	105.0	2.0	330.0	(Kröppl et al., 2011)
mean		***14.6***	***96.9***	***1.3***	***34***	***261***	***22***	***271***	***1059***	***23***	***101***	***5174***	***22.7***	***7.6***	***379***	***24***	***3268***	*n = 107*
median		***7.7***	***70.0***	***0.9***	***31***	***213***	***19***	***227***	***421***	***25***	***140***	***532***	***25.5***	***10.0***	***284***	***28***	***2563***	
minimum		***2.1***	***5.0***	***0.1***	***4***	***14***	***4***	***20***	***91***	***5***	***5***	***0***	***5.0***	***1.0***	***105***	***2***	***330***	
10th precentile		***3.4***	***15.0***	***0.1***	***6***	***29***	***5***	***95***	***137***	***9***	***5***	***99***	***5.0***	***1.0***	***134***	***10***	***640***	
90th percentile		***27.1***	***290.0***	***3.0***	***74***	***602***	***36***	***485***	***2561***	***39***	***196***	***14600***	***37.5***	***11.2***	***661***	***39***	***6600***	
maximum		***105.0***	***318.0***	***4.2***	***82***	***892***	***62***	***671***	***4260***	***39***	***200***	***35740***	***43.0***	***12.0***	***741***	***41***	***9100***	
coefficient of variation		***1.4***	***1.1***	***1.1***	***0.7***	***1.0***	***0.8***	***0.7***	***1.2***	***0.5***	***0.8***	***1.5***	***0.7***		***0.6***	***0.6***	***1.0***	
grass																		
Miscanthus	4											3100						(Miles et al., 1995; Moilanen, 2006; Wigley e
straw																		
wheat	1	3	22	0.3	5	20	7	17	271	25	5	700	5	10	55	10	238	(Lanzerstorfer, 2015)
wheat	1	8	7	0.4	5	20	10	103	33	33	5	40	46	10	25	13	325	(Lanzerstorfer, 2015)
Corn	1								338			620					374	(Masia et al., 2007)
Oat	1											775						(Theis et al., 2006)

Rape	1								338				310							249	(Masia et al., 2007)
Rice	3												2790								(Miles et al., 1995; Thy et al., 2000; Thy et a
Straw	2												155								(Wieck-Hansen et al., 2000; Wei et al., 2005
straw ash	1	0.1	4.7	0.0	3.7	1.0														81.0	(Schiemenz et al., 2011)
Wheat	14												540								(Risnes et al., 2003; Moilanen, 2006; Thy et
																					(Miles et al., 1995; Bryers, 1996; Miles et al.
Wheat (unknown)	1	1.4			14.3		3.8		684	0.9	2	38	752			3	0.4		12.8	65	(Thy et al., 2008)
Wheat (unknown)	1	1.9			31.5		4.4		786	0.9	6	68	896			0.8	2		16.8	94	(Thy et al., 2008)
Wheat (unknown)	1	1.8			23.5		4.6		826	1.0	7	56	915			0.9	0.9		18.6	98	(Thy et al., 2008)
Wheat (unknown)	1	1.6			22.3		4.5		741	0.9	5	50	842			1.1	1.2		15.3	80	(Thy et al., 2008)
Wheat (unknown)	1	1.7			20.5		4.5		800	0.9	9	48	851			1.5	0.9		16.6	77	(Thy et al., 2008)
Wheat (unknown)	1	2			19.1		5		783	0.9	6	52	892			1.7	20.6		17	85	(Thy et al., 2008)
Wheat (unknown)	1	1.4			19.6		4.3		750	0.9	3	52	822			2.7	20.7		16.5	77	(Thy et al., 2008)
Wheat (unknown)	1	1.8			17.1		5.6		711	0.9	17	76	811			2.7	0.6		14.6	94	(Thy et al., 2008)
Wheat (unknown)	1	1.4			17.6		4.1		699	0.9	2	42	779			2.7	0.7		15.4	70	(Thy et al., 2008)
Wheat (unknown)	1	1.2			19		11.8		647	0.9	2	32	732			2.5	0.4		17.7	61	(Thy et al., 2008)
Straw (unknown)	1												200								(Zevenhoven et al., 2012)
Straw (unknown)	1												0								(Zevenhoven et al., 2012)
Straw (unknown)	1												55								(Zevenhoven et al., 2012)
Straw (unknown)	1												66								(Zevenhoven et al., 2012)
Straw (unknown)	1												11								(Zevenhoven et al., 2012)
Straw (unknown)	1												9								(Zevenhoven et al., 2012)
Rice (unknown)	1	0.2			9.9		3.1		131	1.1	7	20	4348				0.4		4	162	(Thy et al., 2008)
Rice (unknown)	1	0.1			10.4		2.8		118	1.1	7	29	3899			0.1	0.8		3.3	184	(Thy et al., 2008)
Rice (unknown)	1	0.3			11.8		4		129	1.1	7	26	4127			0.1	0.5		4.1	192	(Thy et al., 2008)
Rice (unknown)	1	0.3			16.7		6		118	1.1	6	24	3726				0.4		3.6	185	(Thy et al., 2008)
Rice (unknown)	1	0.3			13		6.6		113	0.8	7	41	4054			0.1	0.4		3.4	201	(Thy et al., 2008)
Rice (unknown)	1	0.3			7		6.9		118	0.9	6	55	4201				0.4		3.4	218	(Thy et al., 2008)
Rice (unknown)	1	0.5			7.9		5.6		98	0.8	5	37	3559				0.3		2.8	175	(Thy et al., 2008)
Rice (unknown)	1	1			7		6.7		114	0.9	6	32	4175				0.5		3.4	201	(Thy et al., 2008)
Rice (unknown)	1	0.3			12.6		6		107	0.8	4	32	3798				0.3		3.1	187	(Thy et al., 2008)
Rice (unknown)	1	0.4			8.6		6.5		109	0.8	2	60	3921				0.4		3.3	213	(Thy et al., 2008)
Rice (unknown)	1	0.3			8.6		6.4		114	0.9	1	32	4001				0.3		3.2	197	(Thy et al., 2008)
Rice (unknown)	1	0.2			11.1		6.2		104	0.8	1	54	3879				0.4		3.2	211	(Thy et al., 2008)
Rice (unknown)	1	0.3			7.1		5.8		102	0.9	1	33	3557				0.3		2.8	172	(Thy et al., 2008)
Rice (unknown)	1	0.2			5.5		6.1		96	0.9	1	15	3675				0.3		3.3	161	(Thy et al., 2008)
mean		***1.2***	***11.2***	***0.2***	***13.2***	***14***	***5.7***	***60***	***356***	***0.9***	***6.8***	***39.0***	***1829***	***25.5***	***10.0***	***1.5***	***2.3***	***40***	***8.9***	***163***	*n =104*
median		***0.5***	***7.0***	***0.3***	***11.8***	***20***	***5.7***	***60***	***130***	***0.9***	***6.0***	***37.5***	***847***	***25.5***	***10.0***	***1.5***	***0.4***	***40***	***4.1***	***175***	
minimum		***0.1***	***4.7***	***0.0***	***3.7***	***1***	***2.8***	***17***	***33***	***0.8***	***1.0***	***5.0***	***0***	***5.0***	***10.0***	***0.1***	***0.3***	***25***	***2.8***	***61***	
10th precentile		***0.2***	***5.2***	***0.1***	***5.3***	***5***	***3.9***	***26***	***101***	***0.8***	***1.0***	***17.5***	***51***	***9.1***	***10.0***	***0.1***	***0.3***	***28***	***3.2***	***76***	
90th percentile		***1.9***	***19.0***	***0.4***	***21.2***	***20***	***7.0***	***94***	***784***	***1.1***	***13.0***	***58.0***	***4076***	***41.9***	***10.0***	***2.7***	***1.8***	***52***	***16.9***	***240***	

maximum		***8.0***	***22.0***	***0.4***	***31.5***	***20***	***11.8***	***103***	***826***	***1.1***	***33.0***	***76.0***	***4348***	***46.0***	***10.0***	***3.0***	***20.7***	***55***	***18.6***	***374***	
coefficient of variation		***1.3***	***0.8***	***0.8***	***0.5***	***0.8***	***0.3***	***1.0***	***0.8***	***0.1***	***1.1***	***0.5***	***0.9***	***1.1***	***0.0***	***0.7***	***2.5***	***0.5***	***0.7***	***0.5***	
other residues																					
hazelnut shell	1	11	58	0.5	32.6	181	6.9				7.5	416	86.3	11.4	51.5	42	62		14.6	1180	(Demirbas, 2005)
wheat straw	1	9.2	62.5	0.4	30.4	184	7.2				4.2	284	64.1	15.5	56.3	58.5	82		11.2	2680	(Demirbas, 2005)
olive husk	1	12.8	35.2	0.3	26.8	226	8.7				2.8	197	73.5	8.1	50.2	76.6	44.6		16.4	3870	(Demirbas, 2005)
waslnut shell	1	8.4	70.4	0.1	32.7	214	6.4				5	326	48.5	13.7	45.1	67.1	79		12.8	1850	(Demirbas, 2005)
almond shell	1	6.5	18.6	0.2	21.5	132	7.5				3.6	174	29.7	6.8	65.4	49.9	53.6		9.4	1250	(Demirbas, 2005)
sunflower shell	1	7.1	47.3	0.4	29.5	168	5.1				7.1	261	34.6	10.9	37.2	56.4	64.5		15	668	(Demirbas, 2005)
mustard stalks	1	7	61	0.1	35	26	0.1		376			113	77	10		0.1		885	59	161	(Singh et al., 2011)
Olive residue	1								112.0				310.0							249.0	(Masia et al., 2007)
Palm kernels	1								<112				4570.0							748.0	(Masia et al., 2007)
Pepper plant	1												1320.0								(Masia et al., 2007)
Rice husks	5												155.0								(Umantaheswaran and Batra, 2008; Madhiy
																					(Bryers, 1996; Feng et al., 2004)
Rice waste	1												660.0								(Zevenhoven et al., 2012)
Rice waste	1												176.0								(Zevenhoven et al., 2012)
Rice waste	1												182.0								(Zevenhoven et al., 2012)
oil residue	1												12.0								(Zevenhoven et al., 2012)
oil residue	1												25.0								(Zevenhoven et al., 2012)
oil residue	1												60.0								(Zevenhoven et al., 2012)
shell seeds and hulls	1												0.0								(Zevenhoven et al., 2012)
shell seeds and hulls	1												12.0								(Zevenhoven et al., 2012)
shell seeds and hulls	1												4.0								(Zevenhoven et al., 2012)
bagasse	1												48.0								(Zevenhoven et al., 2012)
bagasse	1												43.0								(Zevenhoven et al., 2012)
rape meal ash	1	0.5	228.0	0.0	274.0	11.9														249.0	(Schiemenz et al., 2011)
cereal ash	1	1.3	13.7	0.0	13.1	2.6														750.0	(Schiemenz et al., 2011)
unknown plant origin																					
unknown plant origin	24																				STRUBIAS - ECOFI contribution
animal biomass																					
poultry manure																					
poultry manure	1	1.8	25.3	0.0	21.6	11.9	3.3					585.0								2379.0	STRUBIAS contribution - IE
poultry manure	1								<112											998.0	(Masia et al., 2007; Tortosa Masiá et al., 20
poultry manure	1	0.2	4.5	0.0	5.0	0.9	0.3					69.7	4395.0						2.6	389.7	STRUBIAS contribution - confidential data p
poultry manure	1	1.9	23.0	0.0	31.2	11.3	2.7					526.0	24.0						23.9	2494.0	STRUBIAS contribution - confidential data p
poultry manure	1							110.0			5.6	333.0	1950.0	12.1						1621.0	STRUBIAS contribution - confidential data p

poultry manure	1	3.4	16.2	0.0	18.4	43.6	4.5					216.0							9.2	1652.0	STRUBIAS contribution - confidential data p
poultry manure	?							130.0			2.0	300.0	1200.0	5.0		2.0					STRUBIAS contribution - ESSP (Fibrphos)
poultty manure	415																				STRUBIAS contribution - ESSP (BMC Moer
poultry manure	1		24.0						72.0			176.0	1196							991.0	(Staroń et al., 2016)
poultry manure	1											165.0	209			2.4				136.0	(Blake and Hess, 2014)
poultry manure	1	2.0	14.3		42.0	3.7	1.0				7.0	553.0	4143	96.0					12.0	3795.0	(Lynch et al., 2014)
poultry manure	1		112.0		10.0							71.0	596							209.0	(Abelha et al., 2003)
poultry manure	1	0.4			14.8	6.0	15.0					43.1	1600							600.0	(Codling et al., 2002)
poultry manure	1							249.0				1222.0	3120							2670.0	(Reiter and Middleton, 2016)
poultry manure	1							139.0				1089.0	2160							1510.0	(Reiter and Middleton, 2016)
poultry manure	1							221.0				3429.0	4600							2888.0	(Reiter and Middleton, 2016)
poultry manure	1							234.0				1861.0	2940							2515.0	(Reiter and Middleton, 2016)
poultry manure	1							98.0				809.0	860							2879.0	(Reiter and Middleton, 2016)
poultry manure	1							242.0				3252.0	2450							1793.0	(Reiter and Middleton, 2016)
mean		***1.6***	***31***	***0.0***	***20***	***13***	***4.5***	***178***	***72***		***4.9***	***865***	***2096***	***38***		***2.2***			***12***	***1736***	*n =440*
median		***1.9***	***23***	***0.0***	***18***	***9***	***3.0***	***180***	***72***		***5.6***	***526***	***1950***	***12***		***2.2***			***11***	***1652***	
minimum		***0.2***	***4***	***0.0***	***5***	***1***	***0.3***	***98***	***72***		***2.0***	***43***	***24***	***5***		***2.0***			***3***	***136***	
10th percentile		***0.3***	***10***	***0.0***	***8***	***2***	***0.6***	***106***	***72***		***2.7***	***70***	***364***	***6***		***2.0***			***5***	***317***	
90th percentile		***2.7***	***60***	***0.0***	***36***	***28***	***9.7***	***244***	***72***		***6.7***	***2417***	***4294***	***79***		***2.4***			***20***	***2883***	
maximum		***3.4***	***112***	***0.0***	***42***	***44***	***15.0***	***249***	***72***		***7.0***	***3429***	***4600***	***96***		***2.4***			***24***	***3795***	
coefficient of variation		***0.7***	***1.2***	***0.4***	***0.6***	***1.2***	***1.2***	***0.4***			***0.5***	***1.2***	***1***	***1***		***0.1***			***0.7***	***0.6***	
slaughterhouse waste																					
meat and bone meal	1								<112											623.0	(Masia et al., 2007)
meat and bone meal	1																			0.0	(Deydier et al., 2005)
meat and bone meal (bottom ash)	1	0.4	50.0		25.0	2.0		5.0				50.0							2.0	100.0	STRUBIAS contribution - ESPP
slaughterhouse waste (bottom ash)	1	0.3	136.2		93.0	15			208.4		9.5	189.5			8.7		10	273.8	206.1	262.0	(Coutand et al., 2008)
slaughterhouse waste (fly ash)	1	1.7	115.3		97.0	15			158.0		73.5	133.2			12.1		23	104.1	177.6	1349.0	(Coutand et al., 2008)
slaughterhouse waste (fly ash washed)	1	0.4	155.3		119.9	15			184.6		24.3	213.7			36.9		48	237.0	197.3	3372.0	(Coutand et al., 2008)
chicken feathers	1		51.0						112.0			582.0	1770.0							8444.0	(Staroń et al., 2016)
meat and bone meal	1		36.0						154.0			42.5	76.0							521.0	(Staroń et al., 2016)
meat and bone meal	1	1.0	13.0	5.0	9.0	15	5.0					270.0								940.0	(Skodras et al., 2006)
meat and bone meal	1		5.0	0.0	5.0	5	25.0					5.0	5.0							87.1	(Gulyurtlu et al., 2007)
meat and bone meal (bottom ash)	1	0.3	32.4		17.7	1.3	0.4		43.0	0.9	1.2	70.0		2.7	4.1		1	145.0	3.1	39.2	(Cyr and Ludmann, 2006)
mean		***1.1***	***60***	***0.9***	***41***	***13***	***8.1***	***121***	***120***		***15.7***	***575***	***1587***	***37***		***1.7***			***71***	***1516***	*n =15*
median		***0.6***	***50***	***0.0***	***25***	***15***	***5.0***	***106***	***112***		***6.9***	***133***	***364***	***6***		***2.2***			***20***	***521***	
minimum		***0.2***	***1***	***0.0***	***1***	***1***	***0.3***	***0***	***43***		***0.5***	***1***	***1***	***1***		***0.1***			***1***	***0***	
10th percentile		***0.3***	***6***	***0.0***	***5***	***1***	***0.5***	***2***	***66***		***1.0***	***13***	***3***	***2***		***0.7***			***2***	***16***	
90th percentile		***2.7***	***130***	***2.2***	***97***	***26***	***18.0***	***247***	***187***		***34.1***	***1867***	***4386***	***88***		***2.4***			***198***	***3584***	
maximum		***3.4***	***155***	***5.0***	***120***	***44***	***25.0***	***249***	***208***		***73.5***	***3429***	***4600***	***96***		***2.4***			***206***	***8444***	
coefficient of variation		***1.0***	***0.9***	***2.1***	***1.0***	***1.0***	***1.1***	***0.9***			***1.5***	***1.8***	***1***	***1***		***0.5***			***1.3***	***1.5***	

Contaminated biomass

Waste water treatment sludge (raw)

waste water treatment sludge (raw)	1																			0.5	(Werther et al., 2000)
waste water treatment sludge (raw)	1																			0.5	(Wei et al., 2005)
waste water treatment sludge (raw)	1																			0.5	STRUBIAS contribution - confidential data p
waste water treatment sludge (raw)	1	4.1	142.0	0.1	92.0	440.0				0.5	26.0	1300.0	1900.0	36.0	14.0	1.0			50.0	3600.0	STRUBIAS contribution - confidential data p
wastewater treatment sludge (raw - DE)	252	3.3	267.0	0.8	105.8	151.0	17.5		2173.0		28.1	916.0	1914.0	25.3	23.0	2.5	194.0	578.0	136.0	2535.0	(Krüger and Adam, 2015)
waste water treatment sludge (raw, mono-inc)	191	1.8	66.6	0.1	37.9	50.4	11.1					703.0								1650.0	STRUBIAS contribution - confidential data p
waste water treatment sludge (raw, mono-inc)	196	1.7	89.0	0.5	742.0	77.0	9.3					48.0								2160.0	STRUBIAS contribution - confidential data p
waste water treatment fly ash	1	7.0	1047.0	0.0	119.5	138.0	16.2				27.2	665.5		25.5	6.9		364.0			4472.0	(Kasina et al., 2016)
wastewater treatment sludge (raw - FI)	1																				(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												171.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												98.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												50.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												15.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												20.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												20.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												160.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												94.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												57.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												70.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												211.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												60.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - FI)	1												58.0								(Zevenhoven et al., 2012)
wastewater treatment sludge (raw - UK)	1	8.7	621.5	1.4	212.8	575.0	17.9					563.0		44.8	31.2	1.3				2179.0	(Donatello et al., 2010)
wastewater treatment sludge (raw - UK)	1	3.0	169.0	0.1	70.0	361.5	18.8					305.0		16.7	36.1	3.2				1355.0	(Donatello et al., 2010)
wastewater treatment sludge (raw - UK)	1	2.3	248.5	0.1	70.9	285.0	50.7					317.0		15.7	52.1	2.1				1410.5	(Donatello et al., 2010)
wastewater treatment sludge (raw - UK)	1	1.6	264.5	0.1	81.6	229.5	9.6					354.5		12.6	20.0	2.4				1136.0	(Donatello et al., 2010)
wastewater treatment sludge (raw - UK)	1	17.4	383.5	0.5	143.0	554.5	161.0					556.0		31.4	160.0	2.5				2337.5	(Donatello et al., 2010)
wastewater treatment sludge (raw - UK)	1	1.8	59.6	2.9	61.8	238.5	10.1					398.0		17.4	14.1	5.3				1105.0	(Donatello et al., 2010)
waste water treatment sludge (raw)	1	270.0	490.0	0.5	100.0	4600.0	460.0	300.0	400.0	2.0	12.0	2000.0	810.0	36.0	####	5.0	1200.0		49.0	37.0	(Kalmykova and Karlfeldt Fedje, 2013)
mean		***26.9***	***320.7***	***0.6***	***153***	***642***	***71***					***642***		***25***		***3.1***				***1366***	*n =665*
median		***3.2***	***256.5***	***0.3***	***96***	***262***	***18***					***398***		***17***		***2.5***				***1355***	
minimum		***1.6***	***59.6***	***0.0***	***38***	***50***	***9***					***305***		***13***		***1.3***				***37***	
10th precentile		***1.7***	***68.8***	***0.1***	***63***	***83***	***10***					***312***		***14***		***1.7***				***678***	
90th percentile		***16.5***	***608.4***	***1.3***	***206***	***573***	***161***					***1138***		***40***		***5.1***				***2242***	
maximum		***270.0***	***1047.0***	***2.9***	***742***	***4600***	***460***					***2000***		***45***		***5.3***				***2338***	
coefficient of variation		***2.9***	***0.9***	***1.4***	***1.2***	***2.0***	***1.9***					***0.9***		***0***		***0.5***				***0.6***	

Waste water treatment sludge (post-processed)

wastewater treatment sludge (post-processed)	1	0.3	0.1 (IV)	0.3	56.0	60	3.6				601.0								1710.0	STRUBIAS contribution - ESPP (AshDec pr
wastewater treatment sludge (post-processed)	1	0.7	<1 (IV)	0.1	29.0	14	9.9	74.0		4.0	330.0	2400.0	10.0					32.0	290.0	STRUBIAS contribution - confidential data p
wastewater treatment sludge (post-processed)	1	0.0	<1 (IV)	0.0	<15	<20	0.6				74.0								85.0	STRUBIAS contribution - confidential data p
wastewater treatment sludge (post-processed)	4	0.3	109.5	0.7	17.0	4.2	4.7				115.0								85.0	P-REX (Mephrec process)
wastewater treatment sludge (post-processed)	4	3.9	34.2	0.2	13.9	25.3	10.0				853.0								1394.0	P-REX (LeachPhos process)
wastewater treatment sludge (post-processed)	1	0.4	1.4	0.4	0.4	0.43					1.0								1.0	P-Rex (Ecophos process)
mean		***0.9***	***48.4***	***0.3***	***23.3***	***20.8***	***5.8***				***329.0***								***594.2***	*n =12*
median		***0.4***	***34.2***	***0.3***	***17.0***	***14.0***	***4.7***				***222.5***								***187.5***	
minimum		***0.0***	***0.9***	***0.0***	***0.4***	***0.4***	***0.6***				***0.9***								***0.6***	
10th precentile		***0.2***	***8.0***	***0.0***	***5.8***	***1.9***	***1.8***				***37.5***								***43.0***	
90th percentile		***2.3***	***94.4***	***0.6***	***45.2***	***46.1***	***10.0***				***727.0***								***1552.0***	
maximum		***3.9***	***109.5***	***0.7***	***56.0***	***60.0***	***10.0***				***853.0***								***1710.0***	
coefficient of variation		***1.6***	***1.1***	***0.9***	***0.9***	***1.2***	***0.7***				***1.0***								***1.3***	
mix of wood, treated wood and sewage sludge	1		41.5	0.5	66.5	110	19.2	20.0	780	6	82	2700		1			415	34	11400	(Kröppl et al., 2011)
treated and untreated wood	1		108.0	2.5	65.0	1500	32.9	91.5	3550	14	291	6050		24			410	30	6700	(Kröppl et al., 2011)
treated wood, saw mills, swarf, trimmings	1		215.0	0.5	92.1	3030	59.5	288.0	6000	17	1100	2040		146			360	69	10600	(Kröppl et al., 2011)
slaughterhouse waste and sewage sludge mix	1													1.0		2				STRUBIAS contribution - FEhS
Currency shredded	1																		16.5	
Demolition wood	3																		1.0	
Waste wood	1											77								(Zevenhoven et al., 2012)
Waste wood	1											83								(Zevenhoven et al., 2012)
Waste wood	1											84								(Zevenhoven et al., 2012)
Waste wood	1											76								(Zevenhoven et al., 2012)
Waste wood	1											54								(Zevenhoven et al., 2012)
Waste wood	1											107								(Zevenhoven et al., 2012)
Waste wood	1											77								(Zevenhoven et al., 2012)
Waste wood	1											355								(Zevenhoven et al., 2012)
Waste wood	1											545								(Zevenhoven et al., 2012)
Waste wood	1											159								(Zevenhoven et al., 2012)
Furniture waste	1																		0.3	
Mixed waste paper	1																		2.6	
Greenhouse-plastic waste	1																		0.5	
Refuse-derived fuel	1																		1.1	
Wood yard waste	1																		0.2	
municipal solid waste	1	160	204	8.9	42	1530	18.8			14.2	680	420	16.2	90.2	40.8	130		23.4	3840	(Demirbas, 2005)
municipal solid waste (UK)	8																			(Bogush et al., 2015)
paper industry waste	?	1.7		0.3	32.1	35.9					38.2								110.0	STRUBIAS contribution - CEPI
paper industry waste	391	5.7		0.3	40.0	72.8	17.6				200.9								1545.0	STRUBIAS contribution - CEPI

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Annex V: Comparison of *European Biochar Certificate* Version 4. 8 and *IBI Biochar Standards* Version 2.0

- European Biochar Certificate first publication March 2012 http://www.european-biochar.org/en/home
- IBI Biochar Standards first publication May 2012 http://www.biochar-international.org/characterizationstandard

Parameter	*European Biochar Certificate* V4.8 Status (Parameter) Criteria (Units)	EBC Test Method	*IBI Biochar Standards* V2.0 Status (Parameter) Criteria (Units)	IBI Test Method
C content	**Required (Total C)** Biochar ≥ 50% Bio Carbon Minerals (BCM) < 50% (% of total mass, dry basis)	Total C, H, N analysis by dry combustion IR-detection (DIN 51732, ISO 29541). Inorganic C analysis by determination of carbonate-C content with HCl, as outlined in DIN 51726, ISO 925. Organic C calculated as Total C – Inorganic C.	**Required (Organic C)** 10% Minimum Class 1: ≥60% Class 2: ≥30% and <60% Class 3: ≥10% and <30% (% of total mass, dry basis)	Total C and H analysis by dry combustion-IR detection. Inorganic C analysis by determination of CO_2-C content with 1N HCl, as outlined in ASTM D4373 'Standard Test Method for Rapid Determination of Carbonate Content of Soils'. Organic C calculated as Total C – Inorganic C.
Molar H/C_{org} ratio	**Required** 0.7 maximum (molar ratio)	see above for H and C_{org} determination	**Required** 0.7 maximum (molar ratio)	see above for H and C_{org} determination
Total Ash	**Required** Declaration	DIN 51719, ISO 1171 or EN 14775 – ashing at 550°C, heating at 5 K/min to 106°C under nitrogen atmosphere then at 5 K/min to 550 ° C under oxygen, hold for 1h	**Required** Declaration (% of total mass, dry basis)	ASTM D1762-84 'Standard Test Method for Chemical Analysis of Wood Charcoal'. Ash at 750 °C for 6 hours.
Molar O/C ratio	**Required** 0.4 maximum (molar ratio)	O calculated from ash content, C, H, N, S (DIN 51733, ISO 17247)	**Not required** N/A	N/A
Macro-nutrients (NPK)	**Required (Total N)** Declaration (% of total mass, dry basis)	Dry combustion-IR detection following the same procedure for total C and H (DIN 51732)	**Required (Total N)** Declaration (% of total mass, dry basis)	Dry combustion-IR detection following the same procedure for total C and H
	Required (Total P, K, Mg, Ca) Declaration (% of total mass, dry basis)	Digestion with Lithium metaborate on ash 550 °C according to DIN 51729-11 and determination with ICP-OES according to DIN EN ISO 11885 or ICP-MS according to DIN EN ISO 17294	**Optional (Total P and K)** Declaration (% of total mass, dry basis)	Modified dry ashing followed by ICP (Enders and Lehmann 2012). 500 °C ashing followed by HNO_3 and H_2O_2 digestion and determination by ICP-OES analysis

Parameter	*European Biochar Certificate* V4.8 Status (Parameter) Criteria (Units)	EBC Test Method	*IBI Biochar Standards* V2.0 Status (Parameter) Criteria (Units)	IBI Test Method
	N/A	N/A	**Optional** (Mineral N (ammonium and nitrate)) Declaration (mg kg^{-1})	2M KCl extraction, followed by spectrophotometry (Rayment and Higginson 1992)
			Optional (Available P) Declaration (mg kg^{-1})	2% formic acid followed by spectrophotometry as described by Wang et al (2012)
Electrical conductivity	**Required** Declaration (µS cm^{-1})	Method of the BGK (Federal quality community compost), volume 1, method III. C2 in analogy to DIN ISO 11265 Adding 1:10 H2O to the sample, shaking for 1h, followed by filtration of the solution.	**Required** Declaration (dS m^{-1})	US Composting Council TMECC Section 04.10, modified dilution of 1:20 biochar:deionized H_2O (w:v) and equilibration 90 minutes on the shaker, according to Rajkovich et al (2011)
Liming equivalence	**Not required**		**Required** (if pH > 7) Declaration (% $CaCO_3$)	AOAC 955.01 potentiometric titration on "as received" (i.e., wet) samples. Use dry weight to calculate % $CaCO_3$ and report "per dry sample weight".
pH	**Required** Declaration (pH) If > 10, the delivery slip must feature appropriate handling information	DIN ISO 10390 with 1:5 biochar to 0.01 M $CaCl_2$-solution, 60 min shaking, measuring directly in the suspension	**Required** Declaration (pH)	US Composting Council TMECC Section 04.11, modified dilution of 1:20 biochar: deionized H_2O (w:v) and equilibration 90 minutes on the shaker, according to Rajkovich et al (2011).
Bulk density	**Required** Declaration	Bulk density: DIN 51705	Not required N/A	N/A
Particle size distribution	**Not required** N/A	N/A	**Required** Declaration (% in each size class)	Progressive dry sieving with 50mm, 25mm, 16mm, 8mm, 4mm, 2mm, 1mm, and 0.5mm sieves.
Water content	**Required (Water content)** Declaration (% of total mass, dry basis)	DIN 51718 method A Two step: raw moisture at (40 ± 2)°C until constant mass; hygroscopic moisture in TGA crucible and nitrogen atmosphere at (106 ± 2) ° C to constant mass.	**Required (Moisture content)** Declaration (% of total mass, dry basis)	ASTM D1762-84 'Standard Test Method for Chemical Analysis of Wood Charcoal' (specify measurement date with respect to time from production). Moisture content at 105 °C for 2 hours.

Parameter	*European Biochar Certificate* V4.8 Status (Parameter) Criteria (Units)	EBC Test Method	*IBI Biochar Standards* V2.0 Status (Parameter) Criteria (Units)	IBI Test Method
Surface area	**Required (Specific surface area)** Declaration (preferably higher than 150 $m^2 g^{-1}$)	milled < 50µm, 2h outgassing at 150°C, vacuum, N_2 adsorption, multi-point BET method	**Optional (Total surface area and external surface area)** Declaration ($m^2 g^{-1}$)	ASTM D6556 'Standard Test Method for Carbon Black – Total and External Surface Area by Nitrogen Adsorption'
Water holding capacity	**Optional**	Water holding capacity determining by soaking and drying the sample (E DIN ISO 14238). WHC calculated as mass percentage of saturated and dry mass.	**Not required** N/A	N/A
Volatile matter	**Required (Volatile Organic Compounds (VOCs))** Declaration (% of total mass, dry basis)	Thermal-Gravimetric-Analysis (TGA) using Leco TGA 701 – total mass loss at 950°C	**Optional (Volatile matter)** Declaration (% of total mass, dry basis)	ASTM D1762-84 'Standard Test Method for Chemical Analysis of Wood Charcoal'. VM content at 950 °C for 10 minutes.
Heavy metals, metalloids and other elements	**Required** **Metals: Pb, Cd, Cu, Ni, Hg, Zn, Cr** **Basic grade:** Pb < 150 mg kg^{-1} Cd < 1,5 mg kg^{-1} Cu < 100 mg kg^{-1} Ni < 50 mg kg^{-1} Hg < mg kg^{-1} Zn < 400 mg kg^{-1} Cr < 90 mg kg^{-1} **Premium grade:** Pb < 120 mg kg^{-1} Cd < 1 mg kg^{-1} Cu < 100 mg kg^{-1} Ni < 30 mg kg^{-1} Hg < 1 mg kg^{-1} Zn < 400 mg kg^{-1}	**All metals**: microwave acid digestion with HF/HNO_3 and determination of the metals with ICP-MS (DIN EN ISO 17294-2) **Hg**: DIN EN 1483 Water quality - Determination of mercury - Method using atomic absorption spectrometry (H-AAS)	**Required** **Metals: Pb, Cd, Cu, Ni, Hg, Zn, Cr, Co, Mo** **Metalloids: B, As, Se,** **Others: Cl, Na** **Maximum Allowed Thresholds:** As 12 – 100 mg kg^{-1} Cd 1.4 – 39 mg kg^{-1} Cr 64 – 1200 mg kg^{-1} Co 40 – 150 mg kg^{-1} Cu 63 – 1500 mg kg^{-1} Pb 70 – 500 mg kg^{-1} Hg 1 – 17 mg kg^{-1} Mo 5 – 20 mg kg^{-1} Ni 47 – 600 mg kg^{-1} Se 2 – 36 mg kg^{-1} Zn 200 – 7000 mg kg^{-1} Bo Declaration Cl Declaration Na Declaration	**All elements except Hg and Cl:** i. Microwave-assisted HNO_3 digestion, or ii. HNO_3 digestion, followed by determination with iii. ICP-AES, or iv. Flame AAS (according to US Composting Council TMECC Sections 04.05 and 04.06) **Hg:** US EPA 7471 Mercury in Solid or Semi-Soild Waste (Manual Cold Vapor Technique) **Cl:** water soluble elements followed by ion chromatography or ion-selective electrode (per manufacturers instructions)

Parameter	*European Biochar Certificate* V4.8 Status (Parameter) Criteria (Units)	EBC Test Method	*IBI Biochar Standards* V2.0 Status (Parameter) Criteria (Units)	IBI Test Method
	Cr < 80 mg kg^{-1} **Note1**: **Basic Grade** following Germany's Federal Soil Protection Act (BBodSchV). **Premium Grade** following Switzerland's Chemical Risk Reduction Act (ChemRRV) on recycling fertilizers. **Note2**: biochars with Ni contamination < 100g mg kg^{-1} are permitted for composting purposes only if the valid threshold are complied with in the finished compost.		**Note**: range of Maximum Allowed Thresholds reflects different soil tolerance levels for these elements in compost, biosolids, or soils established by regulatory bodies in the US, Canada, EU and Australia. See Appendix 3 of the IBI Biochar Standards for further information.	
PAHs	**Required** Basic grade: < 12mg kg^{-1} Premium grade < 4mg kg^{-1} total (sum of 16 US EPA PAHs) **Note: Basic grade** based on a value which, taking the latest research into account, only implies a minimum risk for soils and users. **Premium grade** corresponds to the PAH threshold defined in the Swiss Chemical Risk Reduction Act (ChemRRV)	DIN EN 15527 Soxhlet-extraction with toluene and determination with GC-MS or DIN ISO 13877 Soxhlet-extraction with toluene and determination with HPLC or DIN CEN/TS 16181 Soxhlet-extraction with toluene und determination with GC-MS	**Required** 6 – 300 mg kg^{-1} total (sum of 16 US EPA PAHs) AND 3 mg kg^{-1} B(a)P-TEQ B(a)P Toxic Equivalency (TEQ) basis **Note**: range of Maximum Allowed Thresholds reflects different soil tolerance levels for PAHs in compost, biosolids, or soils established by regulatory bodies in the US, Canada, EU and/or Australia. See Appendix 3 of the IBI Biochar Standards for further information.	US EPA 8270 Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) using Soxhlet extraction (US EPA 3540) and 100% toluene as the extracting solvent
PCBs	**Required**	AIR DF 100, HRMS	**Required**	US EPA 8082 Polychlorinated Biphenyls

Parameter	*European Biochar Certificate* V4.8 Status (Parameter) Criteria (Units)	EBC Test Method	*IBI Biochar Standards* V2.0 Status (Parameter) Criteria (Units)	IBI Test Method
	< 0.2mg kg^{-1} **Note:** Threshold based on soil protection regulations applicable in Germany and Switzerland (BBodschV, VBBo, ChemRRV) Analysis only once for each producing unit. Depending on feedstock (see positive list) more regular analysis might be required.	or Soxhlet-extraction with toluene and determination with HRGC-HRMS based on US EPA 8290 (2007-02)	0.2 – 0.5 mg kg^{-1} **Note**: range of Maximum Allowed Thresholds reflects different soil tolerance levels for PCBs in compost, biosolids, or soils established by regulatory bodies in the US, Canada, EU and/or Australia. See Appendix 3 of the IBI Biochar Standards for further information.	(PCBs) Analysis by GC or US EPA 8275 Semivolatile Organic Compounds (PAHs and PCBs) in Soils/Sludges and Solid Wastes Using Thermal Extraction/Gas Chromatography/Mass Spectrometry (TE/GC/MS)
PCDD/Fs	**Required** <20 ng kg^{-1} I-TEQ **Note:** Threshold based on soil protection regulations applicable in Germany and Switzerland (BBodschV, VBBo, ChemRRV) Analysis only once for each producing unit. Depending on feedstock (see positive list) more regular analysis might be required.	AIR DF 100, HRMS or Soxhlet-extraction with toluene and determination with HRGC-HRMS based on US EPA 8290 (2007-02)	**Required** <17 ng kg^{-1} WHO-TEQ **Note**: range of Maximum Allowed Thresholds reflects different soil tolerance levels for PCDD/Fs in compost, biosolids, or soils established by regulatory bodies in the US, Canada, EU and/or Australia. See Appendix 3 of the IBI Biochar Standards for further information.	US EPA 8290 Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS)
Germination inhibition	**Not required** N/A	N/A	**Required** Pass/Fail	OECD methodology (1984) using three test species, as described by Van Zwieten et al (2010)

Annex VI: Contents of major elements (%, dry matter) for C-rich and nutrient-rich pyrolysis materials.

	C	N	P	K	S	Ca	Mg	Fe
				(%, dry matter)				
C-rich pyrolysis materials								
Corn	58.8	1.06	0.2	1.9	0.0	0.9	0.7	0.7
Wheat/barley	60.8	1.41		0.1		1.3	1.0	0.2
Rice straw/husk	43.6	1.4	0.1	0.1	0.4			
Sorghum	56.4	0.74	0.2	0.4				
Soybean stover	75.4	1.59			0.0			
Peanut shell	75.3	1.83	0.2	1.1	0.1	0.3	0.1	
Pecan shell	75.9	0.26		11.6	0.0	0.6	0.1	0.0
Hazelnut shell	77.5	0.52	0.0	0.5		0.3	0.1	
Switchgrass	73.9	0.98	0.2	0.8		0.3		0.0
Bagasse	78.6	0.87	0.1	0.2		0.7	0.2	0.0
Coconut coir	73.8	0.88						
Other	64.9	1.16	0.2	1.4	0.1	0.6	0.3	0.1
Hardwoods	74.4	0.72	0.1	0.9	1.6	1.0	1.0	0.2
Softwoods	74.6	0.79	0.1	1.7	0.0	2.1	1.8	1.0
Food waste	44.4	3.28	0.7	0.9		5.2	0.5	
nutrient-rich pyrolysis materials								
Papermill waste	19.9	0.09	0.1	0.3		28.1	0.3	
Poultry manure/litter	35.3	2.15	3.3	6.0	0.9	10.3	1.2	0.3
Turkey manure/litter	31.8	2.02	3.1	4.8	0.5	4.8	1.0	0.3
Swine manure	44.9	2.79	6.1	2.3	0.8	4.8	2.9	0.6
Dairy manure	58.1	2.37	0.9	1.7	0.3	2.7	1.2	0.6
Cattle manure	48.5	1.9	0.9	4.1	0.4	2.9	1.0	0.3
Animal bone	8.0		12.4	2.0		24.3	5.7	
Sewage sludge	23.8	1.12	4.2					

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Annex VII: Inorganic metals/metalloids and persistent organic pollutants for C-rich and nutrient-rich pyrolysis materials

		Cd	Cr (total)	Hg	Ni	Pb	As	B	Ba	Co	Cu	Mn	Mo	Sb	Se	V	Zn	PAH	PCB¥	reference
		(mg kg-1 dry matter)																		
C-rich pyrolysis materials																				
soybean stover	1										34									Ippolito et al., 2015
pecan shell	1										8.28									Ippolito et al., 2015
coconut coir	1										66.2									Ippolito et al., 2015
rice (300°C)	1																	2		Freddo et al., 2012
rice (600°C)	1																	1		Freddo et al., 2012
bamboo (300°C)	1	0.03	4.3		1.4	1.9	0.3				10						124	2		Freddo et al., 2012
bamboo (600°C)	1	0.03	3.4		1.2	3.9	0.3				6.3						207	1		Freddo et al., 2012
redwood (300°C)	1	0.94	4.5		0.4	0.6	0.1				2						38	4		Freddo et al., 2012
redwood (600°C)	1	0.02	3.4		0.6	0.9	0.2				2						38	0		Freddo et al., 2012
maize (300°C)	1	0.03	5.1		0.4	0.1	0.2				10.6						92	4		Freddo et al., 2012
maize (600°C)	1	0.03	6.5		0.6	1.1	0.2				13.2						54	5		Freddo et al., 2012
softwood (500°C)	1	0.02	0.1		0.1	0.1	0				0.04						0.9	9		Freddo et al., 2012
pine	1	0.1	2.8			1					14						16			Knowles et al., 2008
sawdust	1				7						48	185					31			Mankasing et al., 2011
palm leaves	1				7						87	193					46			Mankasing et al., 2011
rice paddy husk	1				10						27	704					77			Mankasing et al., 2011
rice paddy husk	1				2						8	321					36			Mankasing et al., 2011
Prosopis	1				26						20	940					48			Mankasing et al., 2011
cassia stems	1				12						29	191					46			Mankasing et al., 2011
citrous wood	1							60			39	145					505			Graber et al., 2010
peanut hulls (400°C)	1	1	4		2			32			16	116	5				35			Gaskin et al., 2008
peanut hulls (500°C)	1		4		2			34			19	131					37			Gaskin et al., 2008
pine chips (400°C)	1				2			6			25	274					15			Gaskin et al., 2008
pine chips (500°C)	1		3		3			4			9	258					18			Gaskin et al., 2008
wood	5	1	10	0.1	11	9	3	19	20	3	12	215	3.5	5		3	102	10.5		ECN, 2017
herbaceous plants	9	0.1	12.1	0	17	45	4	55	97	6	19	380	2.3	6	2	8	48	15.5		ECN, 2017

plant (unknown)	1	<0.3	6	<0.02	3	1	<1		<1	3			<0.3	19	1	-		Someus, 2015
plant (unknown)	1	<0.3	9	0.04	13	8	<1		1	9			<0.3	150	5	-		Someus, 2015
plant (unknown)	1	0.4	15	<1	14	14	1		3	49			0.5	294	0	-		Someus, 2015
other	1									4.76								Ippolito et al., 2015
shrub cutting (untreated)	1	0.56	81.5	0.01	75.4	23	1.9											STRUBIAS - EUROFEMA
slug pellet (98% wheat flour, 2% ferric phosphate)	1	0.49	69.5	0.01	60.4	19	1.6											STRUBIAS - EUROFEMA
tobacco flour	1	0.42	46.1	0.01	31.1	4	0.55											STRUBIAS - EUROFEMA
carbonaceous product	1	0	4	0	5	16	3			25				45				STRUBIAS - EUROFEMA
mineral-rich pyrolysis materials																		
fermentation residues	1	0.58	181	0.01	237	29	2.33											
poultry manure/litter	1									472							0.4	Ippolito et al., 2015
poultry litter (400°C)	1	3	28		14			91		805	596	17		628				Gaskin et al., 2008
poultry litter (500°C)	1		59		20			100		1034	725	14		752				Gaskin et al., 2008
poultry litter (350°C)	1	0.25			8	1				213								Uchimiya et al., 2015
poultry litter (700°C)	1	0.11			11	1				310								Uchimiya et al., 2016
turkey manure/litter	1									107							0.4	Ippolito et al., 2015
turkey litter (350°C)	1	0.7			29	2				535								Uchimiya et al., 2019
turkey litter (700°C)	1	0.7			40	-				762								Uchimiya et al., 2020
swine manure	1	<1	11	<0.01	18	<10	1.2			377				1098	<0.1			STRUBIAS - confidential
swine manure	1									114							0.4	Ippolito et al., 2015
swine solids (350°C)	1	0.57			16	3				1538								Uchimiya et al., 2017
swine solids (700°C)	1	0.23			26	-				2446								Uchimiya et al., 2018
dairy manure	1									222							0.4	Ippolito et al., 2015
dairy manure (350°C)	1	0.2			16	1				99								Uchimiya et al., 2011
dairy manure (700°C)	1	-			25	0				163								Uchimiya et al., 2012
paved feedlock manure (350°C)	1	0.2			4	1				92								Uchimiya et al., 2013
paved feedlock manure (700°C)	1	0.02			7	0				136								Uchimiya et al., 2014
animal bone	1	<0.3	<1	<0.03	<1	<1	<1		<1	8			<0.3	203				Someus, 2015

material															
papermill waste	1									513					Ippolito et al., 2015
undetermined	1	<0.5	11	<0.05	7.9	<5	<4	98.2	5.52	158	1070	10.9	<2	1500	STRUBIAS - confidential

¥: WHO eq, ng kg-1 dry matter

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