Annex 1

Table S1. Type and chemical composition (wt. %) of the analysed Cements.

	Type	SiO$_2$	CaO	Al$_2$O$_3$	Fe$_2$O$_3$	MgO	MnO	Na$_2$O	K$_2$O	TiO$_2$	SO$_3$	Other Oxides	LoI*
C17	Belitic cement 30%FA	37.46	28.56	14.31	5.82	2.00	0.05	1.29	1.74	0.85	3.47	0.36	3.31
C18	CEM I 52.5 R	20.00	64.08	4.37	2.53	1.87	0.09	0.13	0.77	0.21	2.89	0.45	2.78
C19	CEM I	37.93	28.40	14.48	5.77	1.99	0.06	1.31	1.74	0.86	3.52	0.36	3.30
C20	CEM I 42.5R	19.97	56.74	6.16	3.21	1.21	0.07	0.33	0.86	0.25	3.75	0.42	6.08
C21	CEM I 52.5 R	19.63	64.37	5.66	2.43	0.86	0.06	0.04	0.64	0.23	3.59	0.23	3.05
C22	CAC	4.53	37.34	38.88	12.46	0.63	-	0.03	0.13	1.65	-	0.24	0.25
C23	CEM I 42.5 R	19.47	63.83	5.73	2.68	0.90	0.05	0.05	0.63	0.22	3.15	0.17	3.57
C24	CEM I 52-5 N-SR	20.55	63.66	3.84	4.20	0.75	0.16	0.01	0.58	0.18	3.06	0.19	3.32
C25	CEM I 42.5 R	19.84	63.78	5.38	2.43	1.48	0.07	0.04	0.70	0.24	3.33	0.26	2.78
C26	CEM I 52.5R R-SR	20.59	64.41	3.72	3.23	1.50	-	0.10	0.60	0.21	3.03	0.43	3.01
C27	CAC	4.40	39.43	37.9	14.93	0.76	0.19	-	0.09	1.80	0.02	0.32	0.68

LoI: Lost on Ignition

Table S2. Type and chemical composition (wt. %) of the analysed Fly Ashes.

	Type*	SiO$_2$	CaO	Al$_2$O$_3$	Fe$_2$O$_3$	MgO	MnO	Na$_2$O	K$_2$O	TiO$_2$	SO$_3$	Other Oxides	LoI**
FA12	F	51.80	2.69	25.30	13.43	0.91	0.04	0.45	2.46	0.81	-	0.07	1.72
FA13	F	53.90	5.32	26.00	6.01	1.73	-	0.36	2.38	1.30	0.45	0.69	1.68
FA14	F	56.97	9.67	18.80	4.10	1.39	0.12	1.66	3.00	0.80	0.45	1.14	1.93
FA15	F	55.96	10.55	18.60	4.25	1.50	0.12	1.40	3.03	0.75	0.47	1.05	2.31
FA16	F	45.58	9.17	32.25	4.39	0.76	0.10	0.98	1.17	1.16	0.70	0.44	3.30
FA17	F	44.62	8.24	33.05	4.95	0.84	0.10	0.96	1.23	1.30	0.64	0.66	3.42
FA18	F	42.71	2.21	48.86	1.49	-	-	-	0.34	1.64	0.14	0.37	2.25
FA19	F	54.49	1.37	29.55	5.80	1.15	-	-	2.75	1.58	-	0.47	2.84
FA20	F	56.12	1.03	29.29	5.10	0.79	-	-	2.42	1.58	-	0.46	2.61
FA21	F	41.55	6.37	22.97	23.26	0.70	0.06	0.36	1.33	0.95	0.75	0.27	1.42
FA22	Landfill FA	23.95	21.84	10.08	15.41	6.60	0.18	0.36	0.58	0.76	1.56	0.78	17.88
FA23	F	59.04	2.01	22.50	4.32	0.87	0.02	0.85	1.30	0.84	0.17	0.09	2.32
FA24	F	52.77	6.51	18.10	7.14	2.71	0.06	1.13	1.94	0.83	0.47	0.41	7.93
FA25	F	51.47	2.38	25.61	14.42	1.01	0.04	-	2.47	0.80	-	0.23	1.57
FA26	F	51.94	4.37	25.05	6.38	1.89	0.06	1.24	2.12	1.16	0.11	1.69	3.87

*According to ASTM C618 **LoI: Lost on Ignition*

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Table S3. Type and chemical composition (wt. %) of the analysed Slags.

	Type	SiO_2	CaO	Al_2O_3	Fe_2O_3	MgO	MnO	Na_2O	K_2O	TiO_2	SO_3	ZnO	Other Oxides	LoI*
S6	Blast furnace Vitreous Slag	32.32	45.70	9.59	0.54	7.13	0.17	0.32	0.46	0.94	1.59	-	0.31	0.95
S7	Blast furnace Vitreous Slag	24.05	28.42	9.97	1.60	1.38	1.41	-	0.29	0.29	1.53	0.01	0.28	30.78
S8	Blast furnace Vitreous Slag	34.36	34.13	9.97	2.19	5.65	0.16	1.54	0.79	0.42	2.24	-	0.21	8.35
S9	Nickel Slag	52.92	0.98	2.98	20.39	20.60	0.44	-	-	-	0.10	0.02	1.38	0.19
S10	Blast furnace Vitreous Slag	36.15	18.22	15.10	18.67	3.69	0.70	0.61	1.11	0.75	0.53	1.29	1.95	2.57
S11	Blast furnace Vitreous Slag	16.90	46.39	5.55	2.06	15.80	0.52	-	-	0.22	1.77	0.02	0.17	10.58
S12	Blast furnace Vitreous Slag	33.79	38.78	10.30	0.63	10.50	0.94	-	0.31	1.34	3.08	-	0.12	0.70
S13	Blast furnace Vitreous Slag	34.52	42.21	10.50	0.67	8.30	0.17	-	0.29	0.85	1.74	-	0.13	0.60
S14	Blast furnace Vitreous Slag	38.23	35.30	12.00	0.79	7.23	1.41	-	0.66	1.09	0.80	-	0.16	2.29
S15	Blast furnace Vitreous Slag	34.96	41.12	10.50	0.45	8.90	0.16	-	0.25	0.47	1.28	-	0.10	1.75
S16	Blast furnace Vitreous Slag	34.95	42.47	12.00	0.49	7.73	0.17	-	0.33	0.65	0.86	-	0.15	0.17
S17	Steel slag	12.70	39.06	16.10	18.52	3.99	3.71	-	0.11	0.75	0.29	-	1.16	3.59

LoI: Lost on Ignition

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Table S4. Activity concentration for the gamma emitters in the naturally occurring ^{238}U, ^{235}U, ^{232}Th and ^{40}K series in cements.

Series		^{238}U Radiactive Serie					^{235}U	^{232}Th Radiactive Serie			^{40}K
Cements		^{234}Th	^{226}Ra	^{214}Pb	^{214}Bi	^{210}Pb		^{228}Ac	^{212}Pb	^{208}Tl	
C17	A	79.2 ± 9.3	70 ± 10	72.0 ± 5.5	64.8 ± 2.1	83 ± 13	< 3.5	42.4 ± 1.6	46.1 ± 3.7	18.6 ± 1.2	338 ± 15
	B	74.5 ± 9.0	84 ± 11	81.3 ± 6.3	75.5 ± 2.8	85 ± 13	< 3.0	49.4 ± 1.7	51.8 ± 4.3	20.8 ± 1.4	402 ± 19
C18	A	32.2 ± 5.7	25.2 ± 7.8	27.5 ± 2.2	26.3 ± 1.2	28.9 ± 6.9	< 4.7	20.0 ± 1.0	20.0 ± 1.7	8.51 ± 0.64	216 ± 11
	B	26.0 ± 4.1	24.2 ± 4.9	23.6 ± 1.8	22.27 ± 0.85	24.3 ± 4.9	< 2.1	16.03 ± 0.70	17.7 ± 1.4	7.55 ± 0.50	176.3 ± 8.2
C19	A	81.1 ± 9.5	76 ± 11	79.6 ± 6.2	73.3 ± 2.9	89 ± 14	3.98 ± 0.51	48.4 ± 2.1	50.7 ± 4.2	20.9 ± 1.4	402 ± 19
	B	81 ± 10	76 ± 12	81.6 ± 6.3	76.1 ± 2.7	87 ± 14	< 6.1	50.0 ± 2.0	52.3 ± 4.3	20.9 ± 1.4	417 ± 19
C20	A	41.7 ± 5.8	34.3 ± 6.2	32.7 ± 2.5	30.2 ± 1.1	32.7 ± 5.9	< 2.5	16.27 ± 0.71	17.9 ± 1.5	7.81 ± 0.52	183.2 ± 8.5
	B	43.5 ± 6.4	35.4 ± 7.0	36.5 ± 2.8	32.3 ± 1.7	37.4 ± 6.9	< 3.2	19.1 ± 1.0	19.6 ± 1.7	8.06 ± 0.69	216 ± 11
C21	A	28.7 ± 6.0	< 17.1	18.1 ± 1.6	15.6 ± 1.0	28.4 ± 7.7	< 5.7	19.4 ± 1.2	21.5 ± 1.8	9.02 ± 0.73	205 ± 11
	B	21.3 ± 4.8	18.7 ± 5.7	15.3 ± 1.2	13.02 ± 0.69	18.1 ± 4.9	< 2.8	18.29 ± 0.86	19.8 ± 1.6	7.72 ± 0.53	198 ± 10
C22	A	70.3 ± 8.3	93 ± 11	87.0 ± 6.6	82.6 ± 2.6	24.7 ± 5.4	< 3.9	128.3 ± 4.4	133 ± 11	55.8 ± 3.4	< 0.0
	B	79 ± 10	91 ± 13	90.7 ± 6.9	85.3 ± 2.7	29.3 ± 7.2	< 3.8	130.9 ± 4.4	135 ± 11	56.2 ± 3.5	< 8.9
C23	A	18.4 ± 2.7	17.2 ± 3.4	17.3 ± 1.3	14.15 ± 0.55	10.4 ± 2.6	< 1.6	18.28 ± 0.70	19.9 ± 1.6	7.93 ± 0.50	162.2 ± 7.3
	B	19.4 ± 3.7	21.2 ± 4.7	17.0 ± 1.3	15.03 ± 0.77	< 9.2	< 2.6	21.6 ± 1.4	21.8 ± 1.8	9.41 ± 0.74	187.0 ± 9.5
C24	A	19.2 ± 3.9	18.1 ± 7.3	17.2 ± 1.4	14.67 ± 0.92	17.4 ± 5.3	< 4.5	16.05 ± 0.91	16.1 ± 1.3	5.88 ± 0.52	142.9 ± 7.7
	B	24.0 ± 4.1	19.9 ± 5.0	16.6 ± 1.5	16.18 ± 0.89	23.3 ± 5.3	< 2.4	16.1 ± 1.1	16.6 ± 1.4	7.26 ± 0.58	150.8 ± 7.8
C25	A	31.1 ± 4.8	36.2 ± 5.9	31.9 ± 2.6	30.2 ± 1.4	26.7 ± 5.6	< 2.7	22.0 ± 1.3	23.3 ± 2.0	8.52 ± 0.72	177.0 ± 9.1
	B	31.7 ± 4.9	31.4 ± 6.0	26.0 ± 2.0	23.76 ± 0.92	23.6 ± 4.9	< 2.5	19.08 ± 0.81	21.2 ± 1.7	8.23 ± 0.54	149.1 ± 7.2
C26	A	35.2 ± 4.8	27.6 ± 5.3	30.2 ± 2.4	26.5 ± 1.3	34.5 ± 6.4	< 2.4	14.8 ± 1.5	14.5 ± 1.2	5.62 ± 0.47	146.1 ± 7.5
	B	35.6 ± 5.6	32.9 ± 7.7	28.2 ± 2.2	26.8 ± 1.2	28.7 ± 6.5	< 4.1	11.53 ± 0.71	14.1 ± 1.2	5.28 ± 0.44	134.4 ± 7.0
C27	A	90 ± 11	88 ± 12	89.0 ± 6.8	82.4 ± 2.8	62 ± 11	< 4.1	128.0 ± 4.6	136 ± 11	50.1 ± 3.1	< 5.4
	B	85 ± 11	97 ± 14	91.2 ± 7.0	87.5 ± 2.9	59 ± 11	< 5.3	131.0 ± 4.5	97.3 ± 7.9	50.3 ± 3.1	< 0.0

Uncertainties are expressed for a coverage factor of k=2.

3

Table S5. Activity concentration for the gamma emitters in the naturally occurring ^{238}U, ^{235}U, ^{232}Th and ^{40}K series in Fly Ashes.

Series		^{238}U Radiactive Serie					^{235}U	^{232}Th Radiactive Serie			^{40}K
Fly Ashes		^{234}Th	^{226}Ra	^{214}Pb	^{214}Bi	^{210}Pb		^{228}Ac	^{212}Pb	^{208}Tl	
FA12	A	120 ± 13	112 ± 14	115.0 ± 8.8	106.5 ± 3.5	121 ± 18	5.2 ± 1.0	76.1 ± 2.9	78.4 ± 6.4	29.1 ± 1.9	564 ± 25
FA13	A	80.0 ± 9.2	90 ± 11	81.9 ± 6.2	76.3 ± 2.4	94 ± 14	< 3.0	51.8 ± 1.9	53.4 ± 4.3	20.2 ± 1.3	381 ± 17
	B	93 ± 10	91 ± 11	92.7 ± 7.1	86.5 ± 2.6	102 ± 15	< 2.8	58.7 ± 2.3	60.6 ± 5.0	22.9 ± 1.5	444 ± 20
FA14	A	58.8 ± 8.1	44 ± 10	56.4 ± 4.4	54.4 ± 2.0	54.5 ± 8.8	< 5.4	54.2 ± 2.1	57.5 ± 4.7	24.4 ± 1.6	665 ± 29
	B	54.1 ± 6.9	50.0 ± 8.0	55.8 ± 4.3	50.0 ± 1.6	52.6 ± 8.3	< 3.5	50.5 ± 1.8	55.1 ± 4.5	22.7 ± 1.4	606 ± 26
FA15	A	47.2 ± 7.3	66 ± 11	63.0 ± 4.9	59.7 ± 2.3	59 ± 10	< 6.1	59.1 ± 2.3	61.4 ± 5.0	25.8 ± 1.7	707 ± 31
	B	60.1 ± 8.0	53.9 ± 9.0	59.6 ± 4.7	56.4 ± 2.3	49.4 ± 8.2	< 3.8	58.1 ± 2.6	60.1 ± 4.9	25.3 ± 1.7	699 ± 31
FA16	A	146 ± 18	116 ± 20	136 ± 10	133.9 ± 4.5	142 ± 22	< 9.0	162.2 ± 5.7	171 ± 14	70.1 ± 4.4	115 ± 10
	B	141 ± 16	99 ± 16	122.5 ± 9.3	111.8 ± 3.5	120 ± 18	< 5.3	143.2 ± 4.9	156 ± 13	63.4 ± 3.9	91.3 ± 6.8
FA17	A	167 ± 18	144 ± 19	158 ± 12	148.0 ± 4.5	214 ± 31	6.0 ± 2.9	195.3 ± 6.8	201 ± 16	84.3 ± 5.2	99.2 ± 8.1
	B	162 ± 18	134 ± 20	164 ± 12	154.5 ± 4.7	210 ± 31	< 6.7	196.0 ± 6.6	206 ± 17	84.3 ± 5.2	95.7 ± 8.1
FA18	A	184 ± 20	153 ± 20	165 ± 13	147.2 ± 4.3	149 ± 22	6.74 ± 0.94	225.9 ± 7.5	242 ± 20	99.4 ± 6.1	< 11.4
	B	191 ± 21	172 ± 23	187 ± 14	175.4 ± 5.8	182 ± 27	< 6.4	259 ± 11	271 ± 22	113.7 ± 7.1	< 10.0
FA19	A	130 ± 16	147 ± 20	137 ± 10	129.0 ± 4.2	152 ± 23	< 7.5	109.2 ± 3.9	116.8 ± 9.5	49.5 ± 3.1	538 ± 25
	B	136 ± 15	133 ± 16	141 ± 11	131.5 ± 4.1	141 ± 21	5.39 ± 0.75	110.2 ± 4.1	116.2 ± 9.4	35.3 ± 2.2	533 ± 24
FA20	A	151 ± 17	140 ± 19	160 ± 12	155.3 ± 4.7	158 ± 23	< 4.5	120.3 ± 4.1	126 ± 10	54.1 ± 3.4	487 ± 22
	B	157 ± 17	151 ± 19	156 ± 12	145.4 ± 4.8	144 ± 21	6.7 ± 1.5	118.4 ± 4.5	124 ± 10	37.6 ± 2.4	479 ± 22
FA21	A	157 ± 17	137 ± 17	146 ± 11	135.6 ± 4.9	94 ± 14	5.60 ± 0.70	49.6 ± 1.7	53.1 ± 4.3	21.6 ± 1.3	252 ± 11
	B	167 ± 18	150 ± 19	161 ± 12	149.1 ± 4.7	106 ± 16	7.60 ± 0.92	56.4 ± 2.5	60.2 ± 4.9	24.8 ± 1.7	234 ± 12
FA22	A	37.2 ± 5.5	64.1 ± 8.6	50.1 ± 4.0	43.7 ± 1.7	51.7 ± 8.5	< 3.7	42.7 ± 1.9	43.9 ± 3.6	17.9 ± 1.3	89.9 ± 7.1
	B	42.7 ± 6.6	48.2 ± 8.5	46.5 ± 3.6	42.6 ± 1.9	50.2 ± 8.4	< 3.4	35.8 ± 1.4	38.9 ± 3.2	16.1 ± 1.0	111.6 ± 5.8
FA23	A	120 ± 13	115 ± 14	120.2 ± 9.2	110.8 ± 3.5	125 ± 18	5.3 ± 1.0	96.4 ± 3.5	100.6 ± 8.2	43.8 ± 2.8	245 ± 12
	B	123 ± 14	120 ± 16	120.6 ± 9.2	114.6 ± 3.6	124 ± 19	< 5.6	97.9 ± 3.4	102.9 ± 8.3	44.0 ± 2.7	258 ± 13
FA24	A	76.8 ± 9.0	75 ± 10	71.7 ± 5.6	67.0 ± 2.6	81 ± 12	< 3.8	51.2 ± 2.4	53.7 ± 4.4	23.4 ± 1.6	461 ± 21
	B	69.6 ± 8.3	80 ± 10	70.9 ± 5.5	66.3 ± 2.4	75 ± 11	< 3.6	50.4 ± 2.1	52.7 ± 4.3	23.5 ± 1.6	445 ± 20
FA25	A	123 ± 15	96 ± 16	112.5 ± 8.6	107.2 ± 3.6	101 ± 16	< 6.6	71.4 ± 2.7	76.5 ± 6.2	34.0 ± 2.2	555 ± 25
	B	118 ± 13	102 ± 14	114.2 ± 8.8	103.7 ± 3.7	118 ± 18	4.8 ± 1.2	74.0 ± 2.9	77.1 ± 6.3	34.3 ± 2.3	547 ± 25
FA26	A	185 ± 20	135 ± 19	144 ± 11	134.1 ± 4.1	222 ± 32	6.31 ± 0.74	95.7 ± 3.5	101.2 ± 8.2	41.8 ± 2.6	409 ± 19
	B	177 ± 19	139 ± 19	151 ± 12	143.6 ± 4.3	232 ± 34	< 4.7	95.4 ± 3.3	105.0 ± 8.5	43.5 ± 2.7	418 ± 19

Uncertainties are expressed for a coverage factor of k=2.

4

Table S6. Activity concentration for the gamma emitters in the naturally occurring ^{238}U, ^{235}U, ^{232}Th and ^{40}K series in Slags.

Series		^{238}U Radiactive Serie					^{235}U	^{232}Th Radiactive Serie			^{40}K
Slags		^{234}Th	^{226}Ra	^{214}Pb	^{214}Bi	^{210}Pb		^{228}Ac	^{212}Pb	^{208}Tl	
S6	A	133 ± 15	92 ± 16	125 ± 10	117.9 ± 3.7	< 13.0	< 4.8	46.0 ± 1.8	49.2 ± 4.0	20.0 ± 1.3	59.6 ± 5.0
	B	121 ± 13	94 ± 13	108.9 ± 8.3	95.4 ± 2.9	< 12.2	5.2 ± 1.0	38.0 ± 1.4	43.4 ± 3.5	17.9 ± 1.1	46.8 ± 3.1
S7	A	70.8 ± 8.7	70 ± 10	67.2 ± 5.1	58.6 ± 2.0	23.3 ± 5.1	< 3.7	28.5 ± 1.2	30.6 ± 2.5	12.35 ± 0.76	176.3 ± 8.9
	B	68.1 ± 8.6	70 ± 11	66.0 ± 5.1	58.2 ± 2.1	23.8 ± 5.4	4.7 ± 1.3	27.5 ± 1.3	30.4 ± 2.5	11.79 ± 0.81	180.4 ± 9.3
S8	A	61.5 ± 8.0	59.6 ± 9.4	59.9 ± 4.7	55.1 ± 2.4	38.2 ± 6.9	< 4.1	42.0 ± 2.3	44.6 ± 3.6	18.1 ± 1.3	183 ± 11
	B	55.5 ± 7.4	58.3 ± 9.3	53.8 ± 4.1	48.0 ± 1.8	30.7 ± 5.8	< 3.6	38.2 ± 1.6	40.5 ± 3.3	16.7 ± 1.1	163.4 ± 8.5
S9	A	< 5.0	< 5.9	< 1.0	< 1.1	< 4.7	< 1.8	< 1.4	1.02 ± 0.11	0.378 ± 0.053	3.28 ± 0.65
	B	< 5.4	6.5 ± 2.6	< 1.2	< 1.0	< 5.1	< 1.9	< 1.5	1.09 ± 0.25	< 0.4	< 4.4
S10	A	292 ± 32	249 ± 34	283 ± 22	265.1 ± 7.9	137 ± 21	12.6 ± 5.1	85.8 ± 3.2	92.4 ± 7.5	38.6 ± 2.4	37.1 ± 6.5
	B	299 ± 32	232 ± 31	274 ± 21	257.4 ± 7.7	147 ± 22	8.2 ± 1.5	82.9 ± 3.5	90.0 ± 7.3	27.9 ± 1.8	30.8 ± 6.1
S11	A	28.0 ± 4.1	16.8 ± 4.5	16.7 ± 1.3	13.65 ± 0.62	< 6.7	< 2.0	4.81 ± 0.33	5.95 ± 0.50	2.33 ± 0.19	< 4.8
	B	28.5 ± 3.4	22.1 ± 3.7	19.4 ± 1.6	17.77 ± 0.86	< 4.5	< 1.6	5.89 ± 0.32	6.55 ± 0.59	2.73 ± 0.26	< 2.8
S12	A	107 ± 13	119 ± 16	116.4 ± 8.9	107.5 ± 3.5	52.6 ± 9.0	< 6.2	33.1 ± 1.4	37.3 ± 3.0	15.9 ± 1.1	41.3 ± 4.8
	B	114 ± 12	108 ± 13	114.4 ± 8.7	107.6 ± 3.3	50.0 ± 7.8	4.67 ± 0.57	34.1 ± 1.4	36.3 ± 3.0	11.09 ± 0.74	49.5 ± 3.8
S13	A	110 ± 12	99 ± 14	103.3 ± 7.9	95.3 ± 3.0	39.2 ± 7.3	< 3.7	29.1 ± 1.2	30.7 ± 2.5	13.76 ± 0.93	108.4 ± 6.0
	B	99 ± 11	87 ± 12	94.9 ± 7.3	86.9 ± 3.0	34.3 ± 6.5	3.85 ± 0.67	26.7 ± 1.6	29.1 ± 2.4	12.8 ± 1.0	106.4 ± 6.5
S14	A	138 ± 16	146 ± 19	146 ± 11	139.8 ± 4.5	< 17.3	< 7.2	59.0 ± 2.3	62.7 ± 5.1	27.5 ± 1.8	121.7 ± 8.0
	B	150 ± 17	131 ± 17	144 ± 11	133.7 ± 4.3	15.2 ± 4.9	< 3.0	58.5 ± 2.6	62.7 ± 5.1	27.6 ± 1.8	116.3 ± 7.6
S15	A	132 ± 15	141 ± 17	121.1 ± 9.2	115.9 ± 3.5	32.0 ± 6.5	< 3.9	38.7 ± 1.5	40.1 ± 3.3	15.6 ± 1.0	30.2 ± 3.5
	B	129 ± 14	109 ± 14	107.7 ± 8.2	95.0 ± 2.8	30.2 ± 6.2	4.63 ± 0.88	32.3 ± 1.2	35.1 ± 2.8	13.96 ± 0.88	26.8 ± 2.1
S16	A	103 ± 11	102 ± 12	109.5 ± 8.3	101.6 ± 3.0	< 8.5	4.92 ± 0.80	50.5 ± 1.8	52.3 ± 4.2	21.0 ± 1.3	40.8 ± 3.2
	B	104 ± 12	105 ± 13	109.7 ± 8.3	104.2 ± 3.1	< 11.5	< 3.5	49.7 ± 1.8	52.5 ± 4.2	20.8 ± 1.3	40.7 ± 3.2
S17	A	33.3 ± 4.8	37.0 ± 6.3	31.7 ± 2.6	27.9 ± 1.2	< 9.4	< 3.0	17.9 ± 1.3	17.9 ± 1.6	7.17 ± 0.64	20.7 ± 3.5
	B	34.6 ± 5.6	17.0 ± 6.8	22.6 ± 1.8	22.8 ± 1.0	< 13.6	< 3.9	11.73 ± 0.70	12.6 ± 1.0	5.32 ± 0.44	28.1 ± 3.0

Uncertainties are expressed for a coverage factor of k=2.

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Table S7. Activity concentration for the gamma emitters in the naturally occurring [238]U, [235]U, [232]Th and [40]K series, including [241]Am, in Slags.

Series			^{238}U Radiactive Serie					^{235}U	^{232}Th Radiactive Serie			^{40}K	^{241}Am
Slags			^{234}Th	^{226}Ra	^{214}Pb	^{214}Bi	^{210}Pb		^{228}Ac	^{212}Pb	^{208}Tl		
S3	Vitreous	A	44 ± 12	34 ± 11	39.1 ± 6.1	37.6 ± 2.8	30 ± 10	2.23 ± 0.61	62.5 ± 4.6	64 ± 10	23.8 ± 3.0	846 ± 73	3.26 ± 0.38
	Slag	B	35.3 ± 7.4	31.7 ± 7.8	32.7 ± 5.0	29.4 ± 1.9	26.5 ± 8.3	-	52.0 ± 3.5	53.6 ± 8.7	19.6 ± 2.4	632 ± 54	3.15 ± 0.35
S4	Steel	A	20.5 ± 5.3	22.6 ± 8.1	16.1 ± 2.6	15.0 ± 1.4	-	-	5.11 ± 0.61	5.7 ± 1.0	14.3 ± 2.9	-	4.06 ± 0.43
	Slag	B	15.3 ± 3.7	23.2 ± 5.0	17.8 ± 2.8	16.6 ± 1.5	-	-	5.53 ± 0.83	5.5 ± 1.0	49.4 ± 6.5	4.0 ± 2.9	3.77 ± 0.42

Uncertainties are expressed for a coverage factor of k=2.

Table S8. Chemical composition (wt. %) of the analysed Cements, Fly Ashe and Slag used for the models validations.

	SiO$_2$	CaO	Al$_2$O$_3$	Fe$_2$O$_3$	MgO	MnO	Na$_2$O	K$_2$O	TiO$_2$	SO$_3$	LoI*
OPC – CEM I 42.5 R	20.00	62.90	4.20	4.00	1.20	0.00	0.00	0.80	0.20	2.62	3.40
White Cement – BL I 52.5 R	19.66	68.25	4.65	0.25	1.02	0.00	0.00	0.72	0.07	2.67	2.62
White Cement – BL II/B-LL 42.5 R	15.94	65.06	3.84	0.22	0.56	0.00	0.00	0.41	0.08	2.52	11.29
CAC	3.42	35.66	41.38	15.41	0.65	0.00	0.00	0.05	1.91	0.01	2.01
CAC	3.42	35.66	41.38	15.41	0.65	0.00	0.00	0.05	1.91	0.01	2.01
Fly Ash	52.86	3.70	22.07	8.21	2.28	0.07	1.15	2.53	1.04	0.10	4.92
Slag	34.46	42.08	11.47	0.61	8.10	0.27	0.00	0.45	0.80	1.68	0.00

LoI: Lost on Ignition

Table S9. Experimental Activity concentration for the gamma emitters in the naturally occurring ^{238}U, ^{235}U, ^{232}Th and ^{40}K series, in Cements, Fly Ash and Slag used for the models validations.

Series	^{238}U Radiactive Serie					^{235}U	^{232}Th Radiactive Serie			^{40}K
Validations	^{234}Th	^{226}Ra	^{214}Pb	^{214}Bi	^{210}Pb		^{228}Ac	^{212}Pb	^{208}Tl	
OPC CEM I 42.5 R	31.5 ± 4.7	31.6 ± 5.9	31.5 ± 2.5	30.1 ± 1.3	35.3 ± 6.2	< 4.2	16.59 ± 0.88	16.3 ± 1.3	6.03 ± 0.48	210 ± 10
White Cement BL I 52.5 R	30.4 ± 3.0	36.3 ± 4.6	32.0 ± 1.3	31.30 ± 0.78	35.4 ± 3.5	< 5.7	13.02 ± 0.57	10.84 ± 0.47	19.0 ± 1.1	220.8 ± 5.7
White Cement BL II/B-LL 42.5 R	25.3 ± 2.4	23.4 ± 3.2	23.19 ± 0.91	20.01 ± 0.43	33.4 ± 3.4	< 3.1	6.21 ± 0.23	8.54 ± 0.35	14.61 ± 0.58	94.5 ± 2.5
CAC	70.7 ± 3.9	70.6 ± 4.3	72.3 ± 2.7	69.2 ± 1.0	37.2 ± 3.0	2.69 ± 0.25	140.8 ± 2.3	146.7 ± 5.9	52.3 ± 1.6	< 3.0
CAC	63.7 ± 3.6	63.7 ± 4.0	58.7 ± 2.2	60.57 ± 0.86	29.7 ± 2.5	< 1.3	124.0 ± 2.0	110.8 ± 4.5	45.5 ± 1.4	< 4.2
Fly Ash	89.6 ± 4.9	91.2 ± 5.4	86.4 ± 3.3	86.6 ± 1.2	87.9 ± 6.5	< 1.5	64.1 ± 1.1	57.5 ± 2.3	23.02 ± 0.70	438.9 ± 9.4
Slag	115.6 ± 6.1	112.0 ± 6.6	120.6 ± 4.6	113.8 ± 1.7	18.9 ± 1.7	4.02 ± 0.22	43.56 ± 0.79	44.7 ± 1.8	16.44 ± 0.52	119.0 ± 2.8

Uncertainties are expressed for a coverage factor of k=2.

Annex 2

Collinearity in a multiple linear regression model is a common statistical problem that occurs when one or more independent variables in the model are a linear combination of one another, that is, there is a relationship between them.

A correlation matrix was used to determine the relationship between the independent variables (composition, wt.%) of cement, fly ash, and slag (A2.1, A2.2 and A2.3 Tables). The correlation between two variables is higher the closer their absolute values are near to 1.

Table S10. Correlation matrix between independent variables (wt. %) for Cements.

	SiO_2	CaO	Al_2O_3	Fe_2O_3	MgO	MnO	Na_2O	K_2O	TiO_2	SO_3
SiO_2	1.00									
CaO	0.18	1.00								
Al_2O_3	-0.71	-0.81	1.00							
Fe_2O_3	-0.62	-0.73	0.92	1.00						
MgO	0.34	-0.09	-0.24	-0.43	1.00					
MnO	0.04	0.22	-0.16	-0.22	0.18	1.00				
Na_2O	0.51	-0.37	-0.07	-0.21	0.64	0.49	1.00			
K_2O	0.91	0.00	-0.54	-0.51	0.36	-0.11	0.55	1.00		
TiO_2	-0.58	-0.80	0.94	0.97	-0.32	-0.21	-0.11	-0.44	1.00	
SO_3	0.11	0.05	-0.23	-0.53	0.72	0.06	0.37	0.17	-0.44	1.00

Table S11. Correlation matrix between independent variables (wt. %) for Fly Ashes.

	SiO_2	CaO	Al_2O_3	Fe_2O_3	MgO	MnO	Na_2O	K_2O	TiO_2	SO_3
SiO_2	1.00									
CaO	-0.43	1.00								
Al_2O_3	-0.22	-0.44	1.00							
Fe_2O_3	-0.56	0.11	-0.27	1.00						
MgO	-0.09	0.51	-0.67	0.01	1.00					
MnO	0.11	0.51	-0.20	-0.08	-0.12	1.00				
Na_2O	0.21	0.49	-0.47	-0.31	0.51	0.43	1.00			
K_2O	0.54	-0.13	-0.45	-0.10	0.21	-0.02	0.24	1.00		
TiO_2	-0.13	-0.19	0.51	-0.27	-0.29	-0.17	-0.57	-0.41	1.00	
SO_3	-0.20	0.28	-0.01	0.27	-0.23	0.60	0.06	-0.27	0.03	1.00

Table S12. Correlation matrix between independent variables (wt. %) for Slags.

	SiO_2	Al_2O_3	CaO	MgO	Na_2O	K_2O	TiO_2
SiO_2	1.00						
Al_2O_3	-0.29	1.00					
CaO	-0.59	0.10	1.00				
MgO	0.41	-0.75	-0.23	1.00			
Na_2O	0.12	0.16	-0.16	-0.30	1.00		
K_2O	0.25	0.59	-0.25	-0.55	0.66	1.00	
TiO_2	-0.11	0.13	0.53	-0.24	-0.17	0.01	1.00

Due to the collinearity issues that arise from introducing each and every variable when constructing the linear regression models in this work, we chose the backward stepwise regression methodology, in which a model is obtained by iteratively discarding the variables with values of α > 0.05 until a model with independent variables with P-values less than 0.05 is obtained.

After obtaining the multiple linear regression models for ^{226}Ra, ^{232}Th (^{212}Pb), and ^{40}K for cements, fly ash, and slag, the impact of collinearity in the variables maintained in each of the models was investigated. The variance inflation factor (VIF) (A2.4), was calculated to quantify the intensity of the variables collinearity, using the following expression:

$$VIF = \frac{1}{1 - R_i^2}$$

Where R_i^2 is the auxiliary coefficient of determination for each independent variable maintained in each model.

Table S13. Calculated VIF for the variables in the ^{226}Ra, ^{232}Th (^{212}Pb) and ^{40}K models for cements, Fly Ash and Slags.

Cements

^{226}Ra	SiO$_2$	Fe$_2$O$_3$	MnO	TiO$_2$
R_i^2	0.33	0.97	0.10	0.97
VIF	1.50	35.55	1.11	33.60

^{212}Pb	CaO	Al$_2$O$_3$	MgO	K$_2$O	TiO$_2$	SO$_3$
R_i^2	0.77	0.97	0.91	0.77	0.97	0.86
VIF	4.31	34.25	11.45	4.38	34.96	7.00

^{40}K	SiO$_2$	CaO	Al$_2$O$_3$	Na$_2$O	K$_2$O	TiO$_2$
R_i^2	0.98	0.93	0.97	0.73	0.96	0.96
VIF	52.37	13.56	30.45	3.69	23.08	25.48

Fly Ash (FA)

^{226}Ra	Al$_2$O$_3$	Fe$_2$O$_3$	MgO	TiO$_2$
R_i^2	0.93	0.63	0.64	0.92
VIF	13.42	2.67	2.80	13.23

^{212}Pb	CaO	Al$_2$O$_3$	Fe$_2$O$_3$	MgO
R_i^2	0.80	0.68	0.64	0.78
VIF	4.91	3.16	2.77	4.53

^{40}K	K$_2$O	TiO$_2$
R_i^2	0.66	0.66
VIF	2.99	2.99

Slag (S)

^{226}Ra	Na$_2$O	K$_2$O	TiO$_2$
R_i^2	0.54	0.70	0.46
VIF	2.18	3.39	1.87

^{212}Pb	CaO	Na$_2$O	K$_2$O
R_i^2	0.43	0.51	0.67
VIF	1.76	2.04	3.06

^{40}K	SiO$_2$	CaO	MgO	TiO$_2$
R_i^2	0.88	0.88	0.83	0.84
VIF	8.51	8.10	6.01	6.37

According to Kleinbaum et al., [87], VIF values greater than 10 indicate collinearity issues that are aggravated depending on the magnitude of this value. Collinearity has been minimised in the current work using the backward stepwise regression model, which has very little impact on our models because these variables are vector-correlated, as shown in the HJ-Biplot plots in the manuscript.