Annex-1

***grid_x.shp* attribute table**

Column name	Description	type	example
cell_id	Cell identifier	string (9)	4500_3489
OC_30	OC contents in the soil in 0-30cm, in t/ha, (including the organic H horizons formed in conditions of saturation) for the cell	float	58.2
OC_100	OC contents in the soil in 0-100cm, in t/ha, (including the organic H horizons formed in conditions of saturation) for the cell	float	21.3
OC_30_per	% of OC in 0-30cm	float (0..100)	22.5
OC_100_per	% of OC in 0-100cm	float (0..100)	38.9
eros	Actual erosion, in t per ha per year	float	2.4
OC_m_id	OC metadata identifier, referring to an entry in the *meta_x.xls/x_OC_meta* sheet	integer	1
eros_m_id	erosion metadata identifier, referring to an entry in the *meta_x.xls/x_erosion_meta* sheet	integer	1

meta_x.xls/x_OC_meta sheet

Name	description	type	example
OC_m_id	OC metadata identifier, corresponding to values in the *x_data* sheet	Integer (different from 0)	1
BD_M	Method used for measuring bulk density	String(1)	1
BD_PTF	Method used for calculating bulk density (pedotransfer function)	String(2)	02
OC_D	Description of the method and the data for calculating the OC in the cell (adding to the information reported in BD_meta_M and/or BD_meta_PTF	Text	

meta_x.xls/x_erosion_meta sheet

Name	description	type	example
eros_m_id	erosion metadata identifier, corresponding to values in the *x_data* sheet	Integer (different from 0)	1
eros_M	Code for the method used for soil loss assessment	string(2)	
eros_D	Description of the method and the data used for calculating the erosion (in addition to information provided by erosion_M	text	

Soil Organic Carbon data (in the grid_x.shp attribute table)

To standardize the procedures for the estimation of the stock of organic carbon with the current international standard of reference, it is proposed to calculate four separate parameters, two (OC as stock and percentage) for the section 0-30 cm mineral (OC_30 and OC_30_per) and two (OC as stock and percentage) for the section 0-100cm (OC_100 and OC_100_per).

The data on organic carbon refer to the soil only within the cell.

OC_30	soil organic carbon content (stock) for soil in the pixel (t/ha), calculated from 0 to 30 cm
OC_100	soil organic carbon content (stock) for soil in the pixel (t/ha), calculated from 0 to 100 cm
OC_30_per	percentage of organic carbon content for soil in the pixel, 0-30 cm (%), including organic H horizons formed under conditions of saturation
OC_100_per	percentage of organic carbon content for soil in the pixel, 0-100 cm (%), including organic H horizons formed under conditions of saturation.

In the case that OC data cannot be provided for the cell the following codes apply:

-1	if it is **not** applicable to provide a value (e.g. there is no soil in the cell)
-2	if it would be applicable to provide a value, but no data could be calculated

Soil Erosion data (in the grid_x.shp attribute table)

The (actual) soil water erosion (Rill and inter-Rill erosion) are to be provided as quantitative data expressed in *t/ha/yr*. The data on soil erosion refer to the soil only within the pixel.

If the data are the result of the use of models, details on the models used should be provided in the part on the metadata.

Eros	Soil water erosion in the cell (t/ha/yr)

In the case that no erosion data can be provided for the cell the following codes apply:

-1	if it is **not** applicable to provide a value (e.g. there is no soil in the cell)
-2	if it would be applicable to provide a value, but no data could be calculated

The meta data identifiers OC_m_id and eros_m_id (in the grid_x.shp attribute table)

The (integer) values in the *OC_m_id* field in the *grid_x.shp* attribute table should refer/correspond to values reported in the *OC_m_id* field of the *meta_x.xls/x_OC_meta* sheet.

The (integer) values in the *eros_m_id* field in the *grid_x.shp* attribute table should refer/correspond to values reported in the *eros_m_id* field of the *meta_x.xls/x_eros_meta* sheet.

The **value 0** in the *OC_m_id* field and/or the *eros_m_id* field in the *grid_x.shp* attribute table can be used to indicate that no metadata is available for that cell.

The **value 0** should thus **NOT** be used as values in the *OC_m_id* field or *eros_m_id* field of the *meta_x.xls/x_OC_meta* sheet or *meta_x.xls/x_eros_meta* sheet, to indicate meta data.

Soil Organic Carbon Metadata (in the meta_x.xls/x_OC_meta sheet)

Metadata for bulk density used to calculate OC stock as t/ha should be recorded together with information on sources and methods used to assess OC content. Valid values are in the tables below.

BD_m_M: method used to measure bulk density is recorded with the following codes.

BD_m_M		
CODE	**BULK DENSITY METHOD**	**ISO METHOD**
1	Core method (in the field)	ISO 11272 par. 4.1
2	Excavation method	ISO 11272 par. 4.2
3	Clod method	ISO 11272 par. 4.3
9	Other method (specify in the sheet's **OC_D** column)	

BD_m_PTF: pedotransfer functions used to derive bulk density

BD_m_PTF		
CODE		**BULK DENSITY PEDOTRANSFER FUNCTION**
01	Alexander 1980	Alexander, E.B. 1980. Bulk densities of California soils in relation to other soil properties. Soil Sci. Soc. Am. J. 44:689–692.
02	Baumer 1992	Baumer, O.M. 1992. Predicting unsaturated hydraulic parameters. p.341–354. In Proc. of the Int. Workshop on Indirect Methods for Estimating the Hydraulic Properties of Unsaturated Soils, Riverside, CA. 11–13 October 1989. Univ. of California, Riverside.
03	Benitesa 2007	Benitesa Vinícius M., Machadob Pedro L.O.A., Fidalgoa Elaine C.C., Coelhoa Maurício R. and Madarib Beáta E., 2007. Pedotransfer functions for estimating soil bulk density from existing soil survey reports in Brazil. Geoderma, Volume 139, Issues 1-2, 90-97
04	Bernoux 1998	Bernoux, M.., D. Arrouyas, C. Cerri, B. Volkoff and C. Jolivet. 1998. Bulk densities of Brazilian Amazon soils related to other soil properties. Soil Sci. Soc. Am. J. 62:743–749.
05	Boucneau 1998	Boucneau, G., Van Meirvenne, M., and G. Hofman. 1998. Comparing pedotransfer functions to estimate soil bulk density in northern Belgium. Pedologie Themata 5:67–70.
06	De Vosa 2005	Bruno De Vosa, Marc Van Meirvenne, Paul Quataerta, Jozef Deckers and Bart Muys, 2005. Predictive Quality of Pedotransfer Functions for Estimating Bulk Density of Forest Soils. Soil Sci. Soc. Am. J. 69:500-510.
07	Calhoun 2001	Calhoun, F.G., N.E. Smeck, B.L. Slater, J.M. Bigham, and G.F. Hall, 2001. Predicting bulk density of Ohio soils from morphology, genetic principles, and laboratory characterization data. Soil Sci. Soc. Am. J. 65:811–819.
08	Calzolari 2001	Calzolari C., Ungaro, F., Busoni, E., Sanchiz P., 2001. Metodi indiretti per la stima delle proprietà fisico-idrologiche dei suoli. II. Definizione di nuove pedofunzioni Progetto SINA - Carta Pedologica in aree a rischio ambientale, Convenzione RER SGSS - CNR IGES: "Studio del comportamento fisico-idrologico degli strati superficiali del suolo", Rapporto n. 9.2, Febbraio 2001, 42 pp.
09	Federer 1993	Federer, C.A., D.E. Turcotte, and C.T. Smith. 1993. The organic fraction—Bulk-density relationship and the expression of nutrient content in forest soils. Can. J. For. Res. 23:1026–1032.
10	Hallett 1995	Hallett, S.H., Thanigasalam, P. and Hollis, J.M. 1995. SEISMIC: A Desktop Information System for Assessing the Fate and Behaviour of Pesticides in the Environment. Computers and Electronics in Agriculture, 13, 3, 229-244.
11	Heuscher 2005	Heuscher Sonja A., Brandt Craig C. and Jardin Philip M., 2005. Using Soil Physical and Chemical Properties to Estimate Bulk Density. Soil Sci. Soc. Am. J. 69:51-56.
12	Hollis 1996	Hollis, J.M., Brown, C.D. and Hallett, S.H. 1997. Coupling models and Geographical Information Systems for environmental risk evaluation. Actes du Séminaire National; Produits Phytosanitaires, Processus de Transfert et Modélisation dans les Bassins Versants: Hydrosystèmes. Cemagref, Nancy, 22-23 Mai 1996, 203-213.
13	Hollis 1995	Hollis, J.M., Keay, C.,A., Hallett, S.H., Gibbons, J.W. and Court, A.C. 1995. Using CatchIS to Assess the Risk to Water Resources from Diffusely Applied Pesticides. Proceedings Pesticide Movement to Water; British Crop Protection Council, Warwick, UK. 5-2: 345-350.

BD_m_PTF		
CODE		**BULK DENSITY PEDOTRANSFER FUNCTION**
14	Kaur 2002	Kaur, R., Kumar, S., and H.P. Gurung, 2002. A pedo-transfer function (PTF) for estimating soil bulk density from basic soil data and its comparison with existing PTFs. Austr. J. Soil Res. 40:847-857.
15	Leonaviciute 2000	Leonavic˘iute, N. 2000. Predicting soil bulk and particle densities by pedotransfer functions from existing soil data in Lithuania. Geoandgrafijos metras˘tis 33:317–330.
16	Manrique 1991	Manrique L.A., and C.A. Jones. 1991. Bulk density of soils in relation to soil physical and chemical properties. Soil Sci. Soc. Am. J. 55: 476-481.
17	Rawls - Brakensiek 1985	Rawls, W.J. and D.L. Brakensiek. 1985. Prediction of soil water properties for hydrologic modeling. p. 293-299. In: Watershed Management in the Eighties. Eds. Jones, E and Ward, T.J. Proceedings of a Symposium ASCE, Denver, Colorado. 30 Apr. - 2 May 1985. ASCE, New York.
18	Salifu 1999	Salifu, K.F., W.L. Meyer, and H.G. Murchison. 1999. Estimating soil bulk density from organic matter content, pH, silt and clay. Tropic. For. 15:112–120.
19	Kätterer 2006	T. Kätterer, O. Andrén, P-E. Jansson, 2006. Pedotransfer functions for estimating plant available water and bulk density in Swedish agricultural soils. Acta Agriculturae Scandinavica, Section B - Plant Soil Science, Volume 56, Issue 4 December 2006 , pages 263 - 276
20	Rawls 1983	Rawls, W.J. 1983. Estimating soil bulk-density from particle-size analysis and organic matter content. Soil Sci. 135:123–125.
21	Ungaro 2007	Ungaro.F. 2007. Metodi di stima delle propietà fisico-idrologiche dei suoli. Definizione di nuove pedofunzioni per la stima della densità apparente dei suoli della pianura emiliano-romagnola. Convenzione RER SGSS - CNR IRPI: “Carta dei suoli 1: 250.000: realizzazione di strumenti per la corretta gestione del suolo nell’ambito dell’attuale politica agricola comunitaria con specifico riferimento al controllo dell’erosione idrica e dell’inquinamento delle acque”, rapporto n. 1.1, Gennaio 2007, 69 pp.
99	Other pedotransfer function	specify in the sheet’s **OC_D** column

OC_D:

In addition to information provided by **BD_m_M and BD_m_PTF** or if the value in these columns is 9 or 99 (indicating respectively “Other method” or “Other Pedotransfer function”) the data provider may give additional information.

Soil Erosion Metadata (in the x_erosion_meta sheet)

eros_M: method used for soil loss assessment; some predictive models for erosion are listed.

eros_M	
CODE	**METHOD FOR SOIL LOSS ASSESSMENT**
01	USLE (Wischmeier & Smith 1978)
02	EPIC/apex/almanac (Sharpley & Williams 1990)
03	RUSLE (Renard et al. 1997)
04	AGNPS (Young, R.A. et al. 1989)
05	MUSLE (Williams, 1975)
06	USPED (Mitasova et al. 1996)
07	CREAMS (Knisel, 1980)
08	SWRRB (Arnold et al.1990)
09	PSIAC (1968)
10	SPUR (Hanson et al. 1992)
11	SWAT/HUMUS (Arnold et al. 1995)
12	GLEAMS 2.1 (Knisel, 1993)
13	CASC2D (Julien & Saghafian 1991)
14	MULTSED (Simons et al. 1980)
15	ARMSED (Riggins et al 1989)
16	WEPPprof/basin (Flanagan & Nearing 1995)
17	SIMWE (Mitas & Mitasova, 1998)
18	ANSWERS (Beasley et al., 1980)
19	KINEROS (Woolhiser et al., 1990)
20	EUROSEM (Morgan et al.1993)
21	SHE (Abbott et al.1986a,b)
22	SEMMED (De Jong & Riezebos 1997)
23	CSEP (Kirkby and Cox, 1995)
24	MEDRUSH (Kirkby, 1998)
25	EROSION3D (Werner et al., 1997)
26	ACRU (New & Schulze 1996)
27	PISA (Bazzoffi,1993; Bazzoffi et al. 1998)
28	AGQA (Ciccacci et al. 1987)
29	CORINE erosion (EEA, 1995)
30	PESERA (Kirby et al., 2004)
98	Expert judgment
99	Other method (specify in the sheet's **eros_D** column)

eros_D:

In addition to information provided by **eros_M** or if the value in eros_M is 99 (for "Other method") the data provider may give a description of procedures used to assess soil loss in the pixel; for the model used, one could specify: the data sources for the different parameters (e.g. rainfall erosivity, soil erodibility, topography, land cover, etc.), if there have been used functions, raw data or literature data, etc.