

## Table of contents

Foreword	xi
Preface	xiii
Sponsors	xv
<i>Introduction</i>	
<i>GlobalSoilMap project history</i>	3
<i>J.W. Hempel, A.B. McBratney, D. Arrouays, N.J. McKenzie &amp; A.E. Hartemink</i>	
<i>The GlobalSoilMap project specifications</i>	9
<i>D. Arrouays, A.B. McBratney, B. Minasny, J.W. Hempel, G.B.M. Heuvelink, R.A. MacMillan, A.E. Hartemink, P. Lagacherie &amp; N.J. McKenzie</i>	
A new deal for soils—implications of the Global Soil Partnership for <i>GlobalSoilMap</i>	13
<i>N.J. McKenzie</i>	
<i>End-users</i>	
On the need of soil data for environmental assessments: The biofuel example	21
<i>A. Bispo, T. Eglin, I. Feix, C. Le Mouél, A. Gohin, A. Forslund &amp; F. Levert</i>	
<i>Nodes, countries and case study reports</i>	
<i>GlobalSoilMap progress in Oceania</i>	29
<i>M.J. Grundy, A.E. Hewitt, M. Sarwani, I. Ratukalou &amp; A.B. McBratney</i>	
Spatial prediction of soil properties at European scale using the LUCAS database as an harmonization layer	35
<i>C. Ballabio, P. Panagos &amp; L. Montanarella</i>	
<i>GlobalSoilMap North American Node progress</i>	41
<i>J.W. Hempel, Z. Libohova, J.A. Thompson, N.P. Odgers, C.A.S. Smith, G.W. Lelyk &amp; G.E.E. Geraldo</i>	
Soils of Russia— <i>GlobalSoilMap Perspective</i>	47
<i>I. Savin &amp; V. Stolbovoy</i>	
Africa Soil Profiles database: A compilation of georeferenced and standardised legacy soil profile data for Sub-Saharan Africa	51
<i>J.G.B. Leenaars, B. Kempen, A.J.M. van Oostrum &amp; N.H. Batjes</i>	
The experiences of building CZESOTER—Czech form of SOTER in the scale 1:250,000	59
<i>J. Kozak &amp; L. Boruvka</i>	
Legacy data quality and uncertainty estimation for United States <i>GlobalSoilMap</i> products	63
<i>Z. Libohova, S. Wills &amp; N.P. Odgers</i>	
National soil information and potential for delivering <i>GlobalSoilMap</i> products in France: A review	69
<i>N.P.A. Saby, D. Arrouays, C. Jolivet, M.P. Martin, M. Lacoste, R. Ciampalini, A.C. Richer de Forges, B. Laroche &amp; M. Bardy</i>	

The new Australian Grid—a multi-institutional template? <i>M.J. Grundy</i>	73
Regional investigation of soil phosphorus saturation degree, a study case in Switzerland <i>A. Roger, S. Sinaj, Z. Libohova &amp; E. Frossard</i>	79
Towards <i>GlobalSoilMap.net</i> products for The Netherlands <i>B. Kempen, G.B.M. Heuvelink, D.J. Brus &amp; D.J.J. Walvoort</i>	85
Carbon content and stocks in the O-horizons of French forest soils <i>M. Lacoste, M.P. Martin, N.P.A. Saby, J.-B. Paroissien, S. Lehmann, A.C. Richer de Forges &amp; D. Arrouays</i>	91
Suitability of the soil map and legacy data in Wallonia (BE) to support the GSM initiative <i>X. Legrain, L. Bock &amp; G. Colinet</i>	99
Building a national framework for pedometric mapping: Soil depth as an example from Mexico <i>E. Guerrero, A. Pérez, C. Arroyo, J. Equihua &amp; M. Guevara</i>	103
The soil map of Italy: A hierarchy of geodatabases, from soil regions to sub-systems <i>E.A.C. Costantini, R. Barbetti, M. Fantappiè, G. L'Abate, R. Lorenzetti, R. Napoli, A. Marchetti &amp; R. Rivieccio</i>	109
Operational digital soil assessment for enterprise suitability in Tasmania, Australia <i>D.B. Kidd, M.A. Webb, C.J. Grose, R.M. Moreton, B.P. Malone, A.B. McBratney &amp; B. Minasny</i>	113
Soil texture <i>GlobalSoilMap</i> products for the French region “Centre” <i>R. Ciampalini, M.P. Martin, N.P.A. Saby, A.C. Richer de Forges, D. Arrouays, P. Nehlig &amp; G. Martelet</i>	121
The Australian site data collation to support the <i>GlobalSoilMap</i> <i>R. Searle</i>	127
Estimation of <i>GlobalSoilMap.net</i> grids cells from legacy soil data at the regional scale in Southern France <i>K. Vaysse, D. Arrouays, N.J. McKenzie, S. Coste &amp; P. Lagacherie</i>	133
Assessment of potential soil loss rate by wind and water erosion in Jodhpur region of western Rajasthan, India <i>S. Priyabrata, R.K. Goyal, J.C. Tewari, M.M. Roy &amp; J.P. Singh</i>	139
Reflections on <i>GlobalSoilMap.net</i> , DSM and the legacy of soil survey information in Victoria, Australia—the pedology matters <i>R.J. MacEwan, N.J. Robinson, M.P. Imhof, D.B. Rees, J. Hopley &amp; D.M. Crawford</i>	145
The why and how of digital soil mapping in Antarctica <i>P. Roudier, M. McLeod, J. Aislabie &amp; F. Morgan</i>	149
Mapping soil pH and bulk density at multiple soil depths in Denmark <i>K. Adhikari, R.B. Kheir, M.B. Greve, M.H. Greve, B.P. Malone, B. Minasny &amp; A.B. McBratney</i>	155
Estimating and mapping soil Available Water Capacity in Nigeria using legacy data and digital soil mapping techniques <i>S.U. Ugbaje &amp; H.I. Reuter</i>	161
Mapping soils in Ireland <i>I. Simó, R. Corstanje, R. Fealy, S. Hallett, J. Hannam, N. Holden, G. Jahns, B. Jones, P. Massey, T. Mayr, E. McDonald, B. Reidy, R.P.O. Schulte, P. Sills, O. Spaargaren, J. Zawadka &amp; R.E. Creamer</i>	167
Mapping the available water capacity of Australian soils <i>J. Padarian, B. Minasny, A.B. McBratney &amp; N. Dalgliesh</i>	173

Spatial prediction of soil organic carbon at different depths using digital soil mapping <i>F. Collard, N.P.A. Saby, A.C. Richer de Forges, S. Lehmann, J.-B. Paroissien &amp; D. Arrouays</i>	181
A digital soil map of Victoria—VicDSMv1 <i>J. Hopley, D.B. Rees, R.J. MacEwan, R. Clark, K. Benke, M.P. Imhof, N.J. Robinson &amp; D. Bardos</i>	185
Spatial variability of soil properties and soils classification in Teide National Park (Tenerife, Canary Islands) <i>N. Rodríguez, J. Notario, C.D. Arbela, A. Rodríguez-Rodríguez &amp; J.A. Guerra</i>	191
A preliminary analysis of topsoil organic carbon contents and stocks spatial distribution in a region of France (Région Centre) <i>A.C. Richer de Forges, M.P. Martin, N.P.A. Saby, D. Arrouays, G. Martelet &amp; B. Tourlière</i>	197
Spatial disaggregation of soil map polygons to estimate continuous soil property values at a resolution of 90 m for a pilot study area in Manitoba, Canada <i>G.W. Lelyk, R.A. MacMillan, S. Smith &amp; B. Daneshfar</i>	201
Elaboration of novel, countrywide maps for the satisfaction of recent demands on spatial, soil related information in Hungary <i>L. Pásztor, J. Szabó, Zs. Bakacs, A. Laborczi, E. Dohos, G. Illés &amp; G. Szatmári</i>	207
<i>Methodology</i>	
The evolving methodology for global soil mapping <i>J. Padarian, B. Minasny &amp; A.B. McBratney</i>	215
Estimating the Available Water Content of highly heterogeneous soils including stony soils at the regional scale <i>I. Cousin, B. Nicoullaud, M. Tétégan, A.C. Richer de Forges, D. Arrouays &amp; A. Bouthier</i>	221
S-World: A global map of soil properties for modelling <i>J.J. Stoorvogel</i>	227
Part I—Conceptualization of a Meta Soil Model <i>S. Grunwald</i>	233
Part II—Integration of data to work towards a Meta Soil Carbon Model in the U.S. <i>S. Grunwald, B. Cao, X. Xiong, C.W. Ross, R. Patarasuk, J.W. Hempel, L.T. West, S.S. Andrews, S. Wills &amp; T.D. Loecke</i>	239
Parametrization of soil erodibility in a Lesser Himalayan watershed using pedotransfer functions and mixed effects modeling <i>P.S. Datta, H. Schack-Kirchner &amp; E. Hildebrand</i>	245
Modelling soil carbon stocks using legacy site data, in the Mid North region of South Australia <i>C. Liddicoat, D. Maschmedt, D.B. Kidd &amp; R. Searle</i>	253
DSMART: An algorithm to spatially disaggregate soil map units <i>N.P. Odgers, A.B. McBratney, B. Minasny, W. Sun &amp; D. Clifford</i>	261
Comparing spatial prediction methods for soil property mapping in Brazil: A case study for the Rio Doce Basin <i>E. de Souza, T. Hengl, B. Kempen, G.B.M. Heuvelink, E.I.F. Filho &amp; C.E.G.R. Schaefer</i>	267
Spatial disaggregation of conventional soil mapping across Western Australia using DSMART <i>K.W. Holmes, N.P. Odgers, E.A. Griffin &amp; D. van Gool</i>	273
Mapping beyond the solum: Challenges and some solutions <i>M. Thomas, J.R. Wilford, R. Searle &amp; M.J. Grundy</i>	281

Towards methodologies for global soil mapping <i>A.A. Nikiforova, M.E. Fleis &amp; M.M. Borisov</i>	291
Mapping depth-to-rock from legacy data, using a generalized linear mixed model <i>M.J. Pringle, P.R. Zund, J.E. Payne &amp; T.G. Orton</i>	295
Mapping soil digitally with object based image analysis to improve soil map inputs to Digital Soil Mapping <i>P. Wilson, L. Gregory, A. Herklotz &amp; A. Starkey</i>	301
A Python script to produce datasets to support <i>GlobalSoilMap</i> mapping of soil properties <i>J. Daroussin &amp; J. Gallant</i>	307
Digital mapping of selected WRB units based on vast and diverse legacy data <i>I. Waltner, E. Michéli, M. Fuchs, V. Láng, L. Pásztor, Zs. Bakacsi, A. Laborczi &amp; J. Szabó</i>	313
Populating soil maps with legacy data from a soil testing databases <i>J.-B. Paroissien, N.P.A. Saby, A.C. Richer de Forges, D. Arrouays &amp; B. Louis</i>	319
Modelling soil particle-size distribution in the region “Centre” (France) <i>R. Ciampalini, M.P. Martin, N.P.A. Saby, A.C. Richer de Forges, D. Arrouays, P. Nehlig &amp; G. Martelet</i>	325
<i>Uncertainty</i>	
Uncertainty quantification of <i>GlobalSoilMap</i> products <i>G.B.M. Heuvelink</i>	335
Digital soil property mapping and uncertainty estimation using soil class probability rasters <i>N.P. Odgers, A.B. McBratney &amp; B. Minasny</i>	341
A novel approach for validating raster datasets with categorical data <i>E. Dobos, P. Vadnai, D. Bertóti, K. Kovács, E. Michéli, V. Láng &amp; M. Fuchs</i>	347
Multi-source data integration and identification of uncertainties affecting production of a digital soil map <i>N.J. Robinson, K. Benke, J. Hopley, R.J. MacEwan, R. Clark, D.B. Rees, M. Kitching, M.P. Imhof &amp; D. Bardos</i>	353
Developing and assessing prediction intervals for soil property maps derived from legacy databases <i>J.L. Helmick, T.W. Nauman &amp; J.A. Thompson</i>	359
Digital mapping of soil properties and associated uncertainties in the Llanos Orientales, South America <i>J.M. Ashtekar, P.R. Owens, R.A. Brown, H.E. Winzeler, M. Dorantes, Z. Libohova, M. Dasilva &amp; A. Castro</i>	367
3D modelling with spatial uncertainty of soil carbon in Scottish soils <i>L. Poggio &amp; A. Gimona</i>	373
Estimating information levels—Using interpretation to convert data into useable information <i>B.W. Murphy</i>	379
<i>Co-variates</i>	
What can <i>GlobalSoilMap</i> expect from Vis-NIR HyperSpectral Imagery in the near future? <i>P. Lagacherie &amp; C. Gomez</i>	387

Integrating climate into the Digital Soil Assessment framework to assess land suitability <i>M.A. Webb, D.B. Kidd, C.J. Grose, R.M. Moreton, B.P. Malone, A.B. McBratney &amp; B. Minasny</i>	393
Airborne gamma-ray spectrometry: Potential for regolith—soil mapping and characterization <i>G. Martelet, P. Nehlig, D. Arrouays, F. Messner, B. Tourrière, B. Laroche, J. Deparis, N.P.A. Saby, A.C. Richer de Forges, C. Jolivet &amp; C. Ratié</i>	401
In situ prediction of soil chemical properties with visible and near infrared spectroscopy in an African savannah <i>A. Kühnel, C. Bogner &amp; B. Huwe</i>	409
Soil Organic Carbon depth profiles in relation to topographic parameters <i>E. Aldana-Jague, K. Van Oost, B. van Wesemael, N.P.A. Saby &amp; M. Sommer</i>	415
Modelling Soil Organic Carbon stocks using a detailed soil map in a Mediterranean mountainous area <i>I. Simó, C. Herrero, J. Boixadera &amp; R.M. Poch</i>	421
Development of remote sensing methods for assessing and mapping soil pollution with heavy metals <i>Sh.G. Asmaryan, V.S. Muradyan, L.V. Sahakyan, A.K. Saghatelian &amp; T. Warner</i>	429
Lithology as a powerful covariate in digital soil mapping <i>J.M. Gray, T.F.A. Bishop &amp; J.R. Wilford</i>	433
Using airborne thermal inertia mapping to analyze the soil spatial variability at regional scale <i>I. Cousin, C. Pasquier, M. Séger &amp; A. Tabbagh</i>	441
Using aerial gamma-ray and terrain data as lone predictors of dambo catenary units <i>J.S. Lugumira, D.J. Brown, M. Swanson, P.E. Dennison &amp; L. Vierling</i>	447
Assessing soil quality in semiarid tropical region of southern India using GIS and remote sensing <i>U.K. Mandal, K. Venkanna, K.L. Sharma &amp; K. Ramachandran</i>	455
Spatial quantification of soil total carbon, in Djerid arid area, by merging Visible-Near infrared laboratory data to ASTER image data <i>H. Aïchi, Y. Fouad, C. Walter, Z.L. Chabaane &amp; M. Sanaa</i>	461
Electrical multi-depth survey to assess soil cover spatial organization <i>S. Buvat, Y. Coquet, J. Thiesson, A. Tabbagh, J. Michelin &amp; B. Nicoullaud</i>	465
<i>Communication</i>	
Opportunities for information model driven exchange and delivery of <i>GlobalSoilMap</i> data and related products <i>P. Wilson, B. Simons &amp; A. Ritchie</i>	473
Author index	477