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RYAN N. ENGSTROM

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EDUCATION

Ph.D. in Geography, Joint Doctoral Program in Geography **July 2005**
San Diego State University / University of California, Santa Barbara

M.A. in Geography, San Diego State University **May 2000**

B.A. in Geography and Political Science, Villanova University **May 1995**
Membership in Gamma Theta Upsilon Honor Society

WORK EXPERIENCE

Director of Data Science Program, George Washington University **July 2020 –Present**

Professor, Department of Geography **September 2022 – Present**
George Washington University, Director of the Spatial Analysis Lab (SAL) and Center for Urban and Environmental Research (CUER)

Associate Professor, Department of Geography **May 2011-September 2022**
George Washington University, Director of the Spatial Analysis Lab (SAL) and Center for Urban and Environmental Research (CUER)

Assistant Professor, Department of Geography **August 2005-May 2011**
George Washington University, Director of the SAL and CUER

Consultant, World Bank **May 2015-Present**

- Developing methods for estimating variations in poverty and population distributions using remotely sensed observations

Consultant, Fraym **June 2018-June 2022**

- Providing expertise for mapping humanity

Consultant, Radiant.Earth Foundation **Dec. 2017-Dec. 2018**

Consultant, United States Census Bureau, Geographic Studies Branch **Sept. 2006-Oct. 2011**

- Developed methods for distributing census data over space using multi-scale, optical remotely sensed data for the countries of Haiti, Pakistan, and Rwanda

REFEREED JOURNAL PUBLICATIONS

1. Iacone, B., Allington, G., and **Engstrom, R** (2022) A Methodology for Georeferencing and Mosaicking Corona Imagery in Semi-Arid Environments. *Remote Sensing.* 14(21), 5395; https://doi.org/10.3390/rs14215395

2. Masaka, T., Newhouse, D., Silwal, A., Bedada, A, and **Engstrom, R.** (2022) Small Area Estimation of Non-Monetary Poverty with Geospatial Data. *The Review of Economics and Statistics* (*Statistical Journal of the International Association of Official Statistics (IAOS))* DOI: 10.3233/SJI-210902

3. Chao, S., **Engstrom, R.**, Mann, M.L., and Bedada, A. (2021) Evaluating the Ability to Use Contextual Features Derived from Multi-Scale Satellite Imagery to Map Spatial Patterns of Urban Attributes and Population Distributions, *Remote Sensing* 13(9). DOI: /10.3390/rs13193962

4. **Engstrom, R.,** Hersh, J. and Newhouse, D. (2021) Poverty from Space: Using High-Resolution Satellite Imagery for Welfare Estimation, *World Bank Economic Review (WBER). Lhab015. DOI: /10.1093/wber/lhab015*

5. **Engstrom, R**., Newhouse, D., and Soundararajan, V. (2020) Estimating Small Area Population Density Using Satellite Imagery: An Application to Sri Lanka, *PlosONE 15 (8) https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0237063*

6. Hersh, J., **Engstrom, R.** and Mann, M. (2020) Open Data for Development: Mapping Poverty in Belize Using Open Satellite Derived Features and Machine Learning, *Information Technology for Development* https*://doi.org/10.1080/02681102.2020.1811945*

7. Kuffer, M., Thomson, D.R., Boo, G., Mahabir, R.; Grippa, T., Vanhuysse, S., **Engstrom, R**., Ndugwa, R., Makau, J., Darin, E., de Albuquerque, J.P., and Kabaria, C. (2020) The Role of Earth Observation in an Integrated Deprived Area Mapping "System" for Low-to-Middle Income Countries. *Remote Sensing*, **12**, 982. Doi: 10.3390/rs12060982

8. Kugler, T.A., Grace, K., Wrathall, D.J., de Sherbinin, A., Van Riper, D., Aubrecht, C., Comer, D., Adamo, S.B., Cervone, G., **Engstrom, R**., Hultquit, C., Gaughan, A.E., Linard, C., Moran, E., Stevens, F., Tatem, A.J.,Tellman, B., Van Den Hoek, J. (2019) People & Pixels 20 years later: The current data landscape and research trends blending population and environmental data. *Population and Environment*. **41**, pages 209–234 doi.org/10.1007/s11111-019-00326-5

9. Nyland, K.E., Gunn, G.E., Shiklomanov, N.I., **Engstrom, R. N**., and Streletskiy (2018) Land Cover Change in the Lower Yenisei River Using Dense Stacking of Landsat Imagery in Google Earth Engine. *Remote Sensing* 10, 1226 DOI:10.3390/rs10081226

10. Olimb, S. K., Dixon, A.P., Dolfi, E., Anderson, K., and **Engstrom. R**. (2018) Prairie or pasture?: Using time series NDVI to monitor grassland phenology and characteristics in Montana. *Geojournal* 83 (819-834) https://doi.org/10.1007/s10708-017-9805-8

11. Qin, Y., Epstein, H., **Engstrom, R**. and Walker, D. (2017) Circumpolar arctic tundra biomass and productivity dynamics in response to projected climate change and herbivory. *Global Change Biology.* DOI 10.1111/gcb.13632

12. Toure, S., Stow, D., Shih, H.S., Coulter, L., Weeks, J. **Engstrom, R**., and Sandborn, A. (2016) An object-based temporal inversion approach to urban land use change analysis. *Remote Sensing Letters*. DOI 10.1080/2150704X.2016.1157640

13. Sandborn, A. and **Engstrom, R** (2016) Determining the Relationship Between Census Data and Spatial Features Derived From High Resolution Imagery in Accra, Ghana. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS)* Special Issue on Urban Remote Sensing. DOI 10.1109/JSTARS.2016.2519843

14. Yu, Q., Epstein, H., **Engstrom, R**., Shiklomanov, N. and Streletskiy, D. (2015) Land Cover and Land Use Changes in the Oil/Gas Regions of Northwestern Siberia under Changing Climatic Conditions. *Environmental Research Letters*. DOI:10.1088/1748-9326/10/12/124020

15. Gregory EF, Chamberlain JM, Teach S, **Engstrom R**, and Mathison DJ. (2015) Geographic Variation in the use of low acuity pediatric Emergency Medical Services. *Pediatric Emergency Care DOI:* 10.1097/PEC.0000000000000581

16. Mathison, D., Chamberlain, J., Cowan, N., **Engstrom, R.**, Fu, L., Shoo, A., and Teach, S. (2013) Association of Primary Care Spatial Density with Non-Urgent Visits to a Pediatric Emergency Department *Academic Pediatrics* 13 (3):278-285 DOI: 10.1016/j.acap.2013.02.006

17. **Engstrom, R.,** Ofiesh, C., Rain, D., Jewell, H., and Weeks, J. (2013) Defining Neighborhood Boundaries for Urban Health Research in Developing Countries: A Case Study of Accra, Ghana *Journal of Maps* DOI:10.1080/17445647.2013.765366

18. Azar,D., **Engstrom, R**., Graesser, J. and Comenetz, J. (2013) Generation of fine-scale population layers using multi-resolution satellite imagery and geospatial data *Remote Sensing of Environment* 130 219-232. DOI: 10.1016/j.rse.2012.11.022

19. Weeks, J., Getis, A., Stow, D., Hill, A., Rain, D., **Engstrom, R**., Stoler, J., Lippitt, C., Jankowska, M., Lopez, A.C., Coulter, L, and Ofiesh, C., Connecting the Dots between Health, Poverty, and Place in Accra, Ghana (2012) *Annals of the Association of American Geographers* DOI**:** 10.1080/00045608.2012.671132

20. Liljedahl, A., Hinzman, L., Harazano, Y., Zona, D., Tweedie, C., Hollister, R., **Engstrom, R**. and Oechel, W.C., (2011) Nonlinear controls on evapotranspiration in Arctic coastal wetlands. *Biogeosciences* 8, 3375-3389. doi:10.5194/bgd-8-6307-2011

21. Jankowska, M., Weeks, J., and **Engstrom, R.** (2011) Do the Most Vulnerable People Live in the Worst Slums? A Spatial Analysis of Accra Ghana. *Annals of GIS* 17:4, 221-235. DOI:10.1080/19475683.2011.625976

22. **Engstrom, R.** and Hope, A.S. Parameter Sensitivity of the Arctic BIOME BGC Model for Estimating Evapotranspiration in the Arctic Coastal Plain (2011) *Arctic, Antarctic, and Alpine Research* 43(3):380-388 DOI: 10.1657/1938-4246-43.3.380.

23. Azar, D., Graesser, J., **Engstrom, R**., Comenetz, J., Leddy, R., Schechtman, and Andrews, T. (2010) Spatial Refinement of census population distribution using remotely sensed estimates of impervious surface in Haiti. *International Journal of Remote Sensing*. 31: 21, 5635-5655 DOI: 10.1080/01431161.2010.496799.

24. Fu, L., Cowan, N., McLaren, R., **Engstrom, R,** and Teach, S. (2009) Is spatial accessibility to primary care providers associated with vaccination coverage among children with Medicaid insurance? *Pediatrics* 124(6) pp. 1579-1586; DOI: 10.1542/peds.2009-0233.

25. **Engstrom, R.N.,** Hope, A.S., Kwon, H. and Stow, D. (2008) The Relationship between Soil Moisture and NDVI near Barrow, Alaska, *Physical Geography*. 29(1), pp. 38-53; DOI: 10.2747/0272-3646.29.1.38.

26. Stow, D., Peterson, A., Hope, A., **Engstrom. R.** and Coulter L. (2007) Greenness Trends of Arctic Tundra Vegetation in the 1990s: Comparison of Two Normalized Difference Vegetation Index Data Sets from NOAA Advanced Very High Resolution Radiometer Systems *International Journal of Remote Sensing.* Vol. 28 Issue 21, p4807-4822, 16p; DOI: 10.1080/01431160701264284; (*AN 27217146*).

27. Sitch, S., McGuire, A. D., Kimball, J., Gedney, N., Gamon, J., **Engstrom, R.N.**, Wolf, A., Zhuang, Q. and Clein, J. (2007) Assessing the circumpolar carbon balance of arctic tundra with remote sensing and process-based modeling approaches. *Ecological Applications.* 17(1), pp. 213–234 DOI: 10.1890/1051-0761(2007)017[0213:atcboc]2.0.co;2

28. **Engstrom, R.**, Hope, A.S., Kwon, H., Harazano, Y., Oechel, W.C., and Mano, M (2006) Modeling evaporation in Arctic coastal plain ecosystems using a modified version of BIOME BGC. *Journal of Geophysical Research Biogeosciences*- 111, G02021, doi:10.1029/2005JG000102

29. **Engstrom, R. N.**, Hope, A.S., Kwon, H., Stow, D.A. and Zamolodchikov, D. (2005) Spatial distribution of near surface soil moisture and its relationship to microtopography in the Arctic coastal plain. *Hydrology Research,* 36 (3): 219-234. https://doi.org/10.2166/nh.2005.0016

30. Hope, A.S., **Engstrom, R.**, and Stow, D.A. (2005) Relationship between AVHRR surface temperature and NDVI in Arctic Tundra Ecosystems. *International Journal of Remote Sensing,* 26:8, p. 1771-1776. doi.org/10.1080/01431160500043780

31. Vourlitis, G.L., Verfaille, J., Oechel, W.C., Hope, A.S., Stow, D.A. and **Engstrom, R.** (2003) Spatial variation in regional CO_2 exchange for the Kuparuk river basin, Alaska over the summer growing season. *Global Change Biology* 9, p. 930-941. doi: 10.1080/01431160500043780

32. **Engstrom, R. N**., Hope, A. S., Stow, D.A., Vourlitis, G. L., and Oechel, W. C. (2002) Co-variability of the Priestley-Taylor alpha coefficient and regional NDVI in Arctic landscapes, *Journal of the American Water Resources Association (JAWRA)*, 38:6, p. 1647-1659. doi: 10.1111/j.1752-1688.2002.tb04371.x

BOOK CHAPTERS

1. Jennings Anderson, Chad Blevins, Nuala Cowan, Dara Carney-Nedelman, Courtney Clark, Michael Crino, **Ryan Engstrom**, Richard Hinton, Michael Mann, Brent McCusker, Rory Nealon, Patricia Solís, Marcela Zeballos (2022). Reflecting on the YouthMappers Movement, Open Mapping towards Sustainable Development Goals. In Solís, P., Zeballos, M. *Open Mapping towards Sustainable Development Goals*, Springer, DOI: 978-3-031-05181-4

2. **Engstrom, R.,** Ofiesh, C., Rain, D., Jewell, H. and Weeks, J. (2013). Defining Neighborhood Boundaries for Urban Health Research: A Case Study of Accra, Ghana. In Weeks, J., Hill, A., and Stoler, J. (Eds.), *Spatial Inequalities: Health, Poverty and Place in Accra, Ghana* (pp. 27-38). Netherlands, Springer. DOI: 10.1007/978-94-007-6732-4_2

3. Rain, D., **Engstrom, R.,** Ludlow C., and Antos, S. (2011). Accra Ghana: A City Vulnerable to Flooding and Drought-Induced Migration, in Global Report on Human Settlements 2011: Human Settlements Background Study for Chapter 4: UN Publications. https://mirror.unhabitat.org/downloads/docs/GRHS2011/GRHS2011CaseStudyChapter04Accra.pdf

REFEREED CONFERENCE PROCEEDINGS

1. **Engstrom, R.**, Thomson, Dana, Ek, Julia, and Kuffer, Monika (2021) Development of a Multi-City Deprived Area Mapping Ecosystem – *International Geoscience and Remote Sensing Symposium (IGARSS)*, Brussels, Belgium. DOI: 10.1109/IGARSS47720.2021.9555016

2. Kuffer, M., Thomson, D., Boo, G., Mahabir, R., Grippa, T., Vanuysse, S., Porto De Albuquerque, J., **Engstrom, R.**, Ndugwa, R., Makau, J., and Kabaira (2021) An Integrated Deprived Area Mapping "System" EARSeL Joint Workshop – Earth Observation for Sustainable Cities and Communities, Liege, Belgium

3. **Engstrom, R**., Pavelesku, D., Tanaka, T., and Wambile, A. (2019) Mapping Poverty and Slums Using Multiple Methodologies in Accra, Ghana, Joint Urban Remote Sensing Event (JURSE 2019) Vannes, France. DOI: 10.1109/JURSE.2019.8809052

4. **Engstrom, R,** Harrison, R., Mann, M., and Fletcher, A. (2019) Evaluating the Relationship Between Contextual Features Derived from Very High Spatial Resolution Imagery and Urban Attributes: A Case Study in Sri Lanka, Joint Urban Remote Sensing Event (JURSE 2019) Vannes, France. DOI 10.1109/JURSE.2019.8809041

5. **Engstrom, R**., Copenhaver, A., Newhouse, D., Hersh, J., and Haldavanekar, V. (2017) Evaluating the Relationship between Spatial and Spectral Features Derived from High Spatial Resolution Satellite Data and Urban Poverty in Colombo, Sri Lanka. Joint Urban Remote Sensing Event (JURSE 2017) Dubai, UAE. DOI: 10.1109/JURSE.2017.7924590

6. **Engstrom, R**., Copenhaver, A. and Qi, Yang (2016) Evaluating the use of Multiple Imagery Derived Spatial Features to Predict Census Demographic Variables in Accra, Ghana. *International Geoscience and Remote Sensing Symposium (IGARSS)*, Beijing, China 10.1109/IGARSS.2016.7730909

7. Yu, Q., **Engstrom, R**., and Graesser, J. (2016) Contextural Feature Evaluation of Multi-Resolution Imagery. *International Geoscience and Remote Sensing Symposium (IGARSS)*, Beijing, China 10.1109/IGARSS.2016.7730770

8. **Engstrom, R**., Sandborn, A., Yu, Q. and Graesser, J. (2015) Assessing the Relationship Between Spatial Features Derived from High Resolution Satellite Imagery and Census Variables in Accra, Ghana. *International Geoscience and Remote Sensing Symposium (IGARSS)*, Milan, Italy, p. 2544-2547, DOI:10.1109/IGARSS.2015.7326330

9. **Engstrom, R.**, Sandborn, A., Yu, Q. Burgdorfer, J., Stow, D., Weeks, J., and Graesser, J. (2015) Mapping Slums Using Spatial Features in Accra, Ghana. *Joint Urban and Remote Sensing Event Proceedings (JURSE)*, Lausanne, Switzerland, DOI: 10.1109/JURSE.2015.7120494

10. **Engstrom, R.,** Ashcroft, E., Jewell, H., and Rain, D. (2011) Using Remotely Sensed Data to Map Variability in Health and Wealth Indicators in Accra, Ghana. *Joint Urban and Remote Sensing Event Proceedings,* Munich, Germany p. 145-148, DOI: 10.1109/JURSE.2011.5764740

WORKING PAPERS

1. Masaka, T., Newhouse, D., Silwal, A., Bedada, A, and **Engstrom, R.** (2020) Small Area Estimation of Non-Monetary Poverty with Geospatial Data. Policy Research working paper; https://doi.org/10.1596/1813-9450-9383

2. Hersh, J., **Engstrom, R,** Mann, M., Martin, L., Mejía, A. (2020) Mapping Income Poverty in Belize Using Satellite Features and Machine Learning: Inter-American Development Bank Monograph 108, http://dx.doi.org/10.18235/0002345

3. **Engstrom, R,** Newhouse, D., and Soundararajan, V. (2019). *Estimating Small Area Population Density Using Survey Data and Satellite Imagery : An Application to Sri Lanka (English)*. Poverty and Equity Global Practice Working Paper; no. 194. Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/256241552483977593/Estimating-Small-Area-Population-Density-Using-Survey-Data-and-Satellite-Imagery-An-Application-to-Sri-Lanka

4. **Engstrom, R.,** Hersh, J., Newhouse, D. (2017). Poverty from space: using high-resolution satellite imagery for estimating economic well-being (English). Policy Research working paper; no. WPS 8284. Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/610771513691888412/Poverty-from-space-using-high-resolution-satellite-imagery-for-estimating-economic-well-being

TECHNICAL REPORTS

Purnamasari, Ririn Salwa, Febriady, Ade, Wirapati, Bagus A., Farid, M. Noor, Milne, Peter, Kawasoe, Yasuhiro, Vun, Jian, **Engstrom, Ryan**, and Nasiir, Mercoledi. (2021). Welfare Tracking in the Aftermath of Crisis: The Central Sulawesi Disaster Response. World Bank, Jakarta. © World Bank. https://openknowledge.worldbank.org/handle/10986/36649 License: CC BY 3.0 IGO."

FUNDED GRANTS, and FELLOWSHIPS

CO-I, Bill and Melinda Gates Foundation, Joao Porto de Albuquerque PI 2022-2025
IDEAMAPS Network, $1,640,338
GWU PI, GWU Portion $62,210

CO-PI, UK Research and Innovation (UKRI), Caroline Kabaria, PI 2020-2021
Integrated Deprived Area Mapping System (IDEAMAPS) Network

Co-PI, USAID, Patricia Solis ASU PI 2018-2023
YouthMappers, $1,300,000 granted to date with an award limit to $5,500,000. Anonymous private donation match, $1,200,000 and State of Texas match allocated $150,000 of $600,000 award: GWU Portion $1,170,965, GWU PI on Everywhere She Maps portion

PI, University Facilitating Fund (UFF) 2018-2019
Mapping Poverty from Space Using High Spatial Resolution Satellite Imagery
Total Funding: $19,569

Co-I, NSF, Robert Orttung PI, NSF Partnerships for International 2016-2020
Research and Education (PIRE) Promoting Urban Sustainability in the Arctic,
Total Amount: $3,020,645

Co-I, USAID, Patricia Solis TTU PI, 2015-2018
Mappers without Borders
Total Funding Amount: $999,000: GWU Portion: $96,000

Co-PI, GWU Deans Interdisciplinary Collaboration Excellence (DICE) 2015-2016
Differential Risk and Response to Community Violence Exposure among African American Youth, This project uses GIS and a mixed methods approach to look at the impacts of community violence in Washington, DC.-Total Funding: $20,000

Co-I, ROI Grant National Institute of Mental Health (NIMH) 2014-2017
Social-Structural Stressors, Resilience, and Black Men's Sexual Risk, The project is a collaboration between GWU Psychology, Public Health and Geography examining the spatial patterns of HIV in black males, Lisa Bowleg (GWU Psychology) is the lead PI, GWU Geography portion $158,000

PI, Dean's Research Chair 2014-2017
Mapping the Urban Environment using Multi-Scale Satellite Data
One Course Release and $6,000 for scholarly travel

CO-PI (GWU PI), NASA Land Cover and Land Use Change Interdisciplinary Studies, 2012-2015
The Urban Transition in Ghana and Its Relation to Land Cover and Land Use Change Through Analysis of Multi-scale and Multi-temporal Satellite Image Data, Total Award: $993,000 GWU portion: $134,000

Co-I, Jody Ganiban, GWU Psychology PI (CCFF) 2012-2013
Neighborhood determinants of BMI trajectories among ethnic minority youth: Total Award $11,000

Co-PI (GWU PI), RO1 Grant NICHD 2007-2012
Health, Poverty and Place: Modeling Inequalities in Accra Using RS and GIS,
National Institute of Child Health and Human Development,
The project is a collaboration between GWU, Harvard, and San Diego State where John Weeks is the lead PI: Total Award $3,000,000: GW portion: $650,000

Academic Advisor, Ford Foundation 2008-2009
Leadership Institute on Creative Responses to Global Climate Change
This work is with Linda Yarr in the GWU PISA, SIGUR Center
Total Two year budget $253,500

Data Award, GeoEye Foundation 2007
Estimating populations over space in Mozambique, Five High Resolution Satellite Images of different areas in Mozambique, M.A. Student Sarah Antos: $6,600 worth of imagery

Earth System Science Fellowship, NASA 2001-2004
Assessing the affects of variations in soil moisture on the surface energy balance and carbon balance of Arctic tundra ecosystems, Supervisor Allen Hope: $73,000

Doctoral Dissertation Enhancement Grant, National Science Foundation 2002-2004
Effects of sub-grid spatial and temporal variability on modeled evaporation fluxes in Arctic coastal plain ecosystems, Supervisor Allen Hope: $7,750

AWARDS

Ned H. Greenwood Award for Physical Geography SDSU 1999

Best Paper Award, Joint Urban Remote Sensing Event (JURSE) 2019
Engstrom, R., Pavelesku, D., Tanka, T., and Wambile, A. (2019) Mapping Poverty and Slums Using Multiple Methodologies in Accra, Ghana. Joint Urban Remote Sensing Event (JURSE), May 23- Vannes, France - Presentation