DR. KOEL ROYCHOWDHURY

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Department of Geography
Presidency University
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27A/7 Brojomoni Debya Road
Sakherbazar
Kolkata 700008
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EDUCATION:

Doctor of Philosophy on Remote Sensing
Year of Doctorate: 31st August 2012
RMIT University, Melbourne, Australia

M.Sc in GIS and Human Geography
University of Leicester, UK
Year of Passing: 2007
Grade: Merit
Percentage: 62

Post Graduate Diploma in Applied GIS and Remote Sensing,
Jadavpur University, Kolkata
Year of Completion: February, 2006
Grade: A
Percentage: 80.80

M.Sc in Geography
Special Paper: Regional Planning
University Of Calcutta
Year of Passing: 2004
Class: 1st
Percentage: 67.7

B.Sc (Honours)
Special Paper: Regional Planning
Subjects: Geography, Mathematics, Economics
The then Presidency College under affiliation of University Of Calcutta
Year of Passing: 2002
Class: 1st
Percentage: 66.87
Rank: 6th (University of Calcutta)
1st (Annual Exam, 2001)

Higher Secondary Examination
Subjects: English, Bengali, Geography, Mathematics, Economics, Political Science
Gokhale Memorial Girls' School under West Bengal Council of Higher Secondary Education
Year of Passing: 1999
Division: 1st
Percentage: 79.4
Rank: 137th (West Bengal Council of Higher Secondary Education)

Madhyamik Pariksha
Gokhale Memorial Girls' School under West Bengal Board of Secondary Education
Year of Passing: 1997
Division: 1st
Percentage: 89.37
Rank: 42nd (West Bengal Board of Secondary Education)

SCHOLARSHIPS, FELLOWSHIPS AND AWARDS:

• *Japan Society for the Promotion of Science (UNU- JSPS) Postdoctoral Fellowship, 2012*

• *Australian Leadership Award, AusAid, Government of Australia*
2008- 2011

• *DFID Commonwealth Scholarship, Association of Commonwealth Universities,*
Government of Great Britain. 2006-2007

• *National Scholarship, Government of India 1997-1999*

• *National Scholarship, Government of India 1995-1997*

LEADERSHIP/PROFESSIONAL QUALIFICATION:

National Eligibility Test (NET) for Lectureship, conducted by University Grants Commission, India
Year of Qualification: December 2003.

State Level Eligibility Test (SLET) for Lectureship conducted by West Bengal College Service Commission, India.
Year of Qualification: January 2004.

Attended Leadership Workshop as part of Australian Leadership Award Scholarship

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PUBLICATIONS:

Journal article (peer- reviewed):
Roychowdhury, K., Jones, S. D., Arrowsmith, C. & Reinke, K. 2011. A comparison of high and low gain DMSP/OLS satellite images for the study of socio-economic metrics. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 4, 35-42.

Avatar, R., Kumar, P., Surjan, A., Gupta, L.N., Roychowdhury, K. 2013. Geochemical processes regulating groundwater chemistry with special reference to nitrate and fluoride enrichment in Chhatarpur area, Madhya Pradesh, India. Environmental Earth Science, Volume 70, Issue 4, pp 1699-1708.

Gupta, L. N., Avtar, R., Kumar, P., Gupta, G. S., Verma, R. L., Sahu, N., Sil, S., Jayaraman, A., Sharma, K., Roychowdhury, K., Mutisya, E., Sharma, K., Singh, S.K. 2014. Multivariate Approach for Water Quality Assessment of River Mandakini at Chitrakoot, India. Journal of Water Resource and Hydraulic

Engineering (JWRHE),Volume 3, Issue 1, pp 22 - 29.

Roychowdhury, K, Jones, S. 2014. Nexus of Health and Development: Modelling Crude Birth Rate and Maternal Mortality Ratio Using Nighttime Satellite Images, ISPRS International Journal of Geo-Information, Volume3, Issue 2, pp 693-712.

Conference Proceedings (peer-reviewed):

Roychowdhury, K., Jones, S. D. & Arrowsmith, C. 2009. Mapping Urban Areas of India from DMSP/OLS Night-time Images. In: Ostendorf, B., Baldock, P., Burdett, M. & Corcoran, P., eds. Surveying & Spatial Sciences Institute Biennial International Conference, 2009 Adelaide, Australia. Surveying & Spatial Sciences Institute, 319 - 331.

Roychowdhury, K., Jones, S. D., Arrowsmith, C., Reinke, K. & Bedford, A. 2010. The role of satellite data in census: Case study of an Indian State. In: Elvidge, C., ed. Asia-Pacific advanced Network (APAN) Workshop, Hanoi, Vietnam.

Roychowdhury, K., Taubenboeck, H. & Jones, S. D. 2011. Delineating urban, suburban and rural areas using Landsat and DMSP-OLS night-time images. In: Urban Remote Sensing Event (JURSE), 2011 Joint, 11-13 April 2011. 33-36.

Roychowdhury, K., Jones, S. D., Arrowsmith, C. & Reinke, K. 2011. Indian census using satellite images: Can DMSP-OLS data be used for small administrative regions? In: Urban Remote Sensing Event (JURSE), 2011 Joint, 11-13 April 2011. 153-156.

Bhandari, L. & Roychowdhury, K. 2012. Night Lights and Economic Activity in India: A study using DMSP-OLS night time images. Asia-Pacific advanced Network (APAN) Workshop. New Delhi, India.

Roychowdhury, K., 2014. India and the Millennium Development Goals (MDGs): Modelling health and development from satellite images at the subnational level. In: Ames, D.P., Quinn, N.W.T., Rizzoli, A.E. (Eds.), Proceedings of the 7th International Congress on Environmental Modeling and Software, June 15-19, San Diego, California, USA.

Conference Proceedings (non peer-reviewed):

Roychowdhury, K., Jones, S. D. & Arrowsmith, C. 2009. Assessing the utility of DMSP/OLS night-time images for characterizing Indian Urbanization. Joint Urban Remote Sensing Event. Shanghai, China.

Roychowdhury, K., Jones, S. J., Arrowsmith, C. & Reinke, K. 2012. Night-time lights and levels of development: A Study using DMSP-OLS Night-Time Images at the Sub-National Level. In: XXII ISPRS Congress, 25 August – 01 September 2012 Melbourne, Australia. International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 93-98.

Herath, S., Abayakoon, S., Mishra, B., Woldie, D., Roychowdhury, K. 2013. Landslide Risk Assessment for Developing Community Resilience. Srilanka – Japan Collaborative Research (SLJCR) 2013; 29th – 31st March, 2013

Roychowdhury, K., Jones, S. D. 2013. Health Atlas of India: Study using night time satellite images. International Conference on Geospatial Momentum for Society and Environment: AGSE2013, 16-19 December 2013 (Organised by CEPT University, Ahmedabad, India)

CONFERENCE PRESENTATIONS:

October 2008: Annual Spatial Information Research Seminar, Melbourne, Australia
"Studying Indian Urbanization from DMSP-OLS night-time images"

May 2009: Joint Urban Remote Sensing Event, Shanghai, China
"Assessing the utility of DMSP/OLS night time images to study Indian urbanization"

October, 2009: Surveying & Spatial Sciences Institute Biennial International Conference, Adelaide, Australia:
"Mapping Urban Areas of India from DMSP - OLS night-time images"

July 2010: Session on Night-time images at Asia Pacific Advanced Network Seminar, Hanoi, Vietnam
"A Step Towards census from satellite"

April 2011: Joint Urban Remote Sensing Event Munich, Germany
"Use of DMSP-OLS images for proposing census of small regions: Delineating urban, suburban and rural areas using Landsat and DMSP-OLS night-time images"

August 2012: The XXII Congress of the International Society for Photogrammetry and Remote Sensing Melbourne, Australia
"Night-time lights and levels of development: A Study using DMSP-OLS Night-Time Images at the Sub-National Level"

December 2013: International Conference on Geospatial Momentum for Society and Environment: AGSE2013, 16-19 December 2013 (Organised by CEPT University, Ahmedabad, India)
"Health Atlas of India: Study using night time satellite images"

June 2014: International Congress on Environmental Modeling and Software: IEMSs 2014, 15 – 19 June 2014, San Diego, California:
"India and the Millennium Development Goals (MDGs): Modeling health and development from satellite images at the subnational level"

WORK HISTORY:

Name of Organisation/Institution	Position Held	Duration		Nature of work	Reason for leaving
		From (Date)	**To (Date)**		
Institute of Sustainability and Peace, United Nations University, Tokyo	Japan Society for the Promotion of Science (JSPS) Postdoctoral Research Fellow	17/09/2012	Present	Research on environmental and urban sustainability	Continuing
Jawaharlal Nehru Technological University, Hyderabad	Academic Advisor	22/02/2012	30/04/2012	Teaching remote sensing to MTech students	Awarded the Fellowship
Indicus Analytics Pvt. Ltd, New Delhi	Consultant	May 2011	Oct 2011	Research	Project was for 6 months
AAM Pvt. Ltd, Melbourne	GIS Analyst (Part time)	March 2010	June 2011	GIS Data analyses and management	Had to leave Australia on completion of PhD Program

County Council, Leicestershire, United Kingdom	Special Project GIS Officer	March 2007	July 2007	Historical Data Analyses and Management	Project Completed
Ashutosh College, Kolkata	Lecturer in Geography (Part time)	November 2005	August 2006	Teaching students with Geography as Honours and Pass subject	Offered Commonwealth Scholarship to study in the UK
Sarsuna College, Kolkata	Lecturer in Geography (Part time)	August 2005	March2006	Teaching students with Geography as Honours and Pass subject	Offered Commonwealth Scholarship to study in the UK

THESIS/PROJECTS

• *Current work: Sustainable Development from satellite images: The "Green" and "Blue" Components: Case Study: Srilanka*
Institute of Advanced Studies for Sustainability
United Nations University
Ongoing

Abstract and objectives: The term "sustainable development" became popular after the Earth Summit in 1992. From then there have been several attempts to define the indicators that measure the "sustainability" of an area. Sustainable development indicators are defined at global, national and local scales. The compendium of SDI Initiatives, prepared in 2007 by the International Institute of Sustainable Development (IISD) has a database of 836 initiatives (both metropolitan and local) to keep track of the SDI indicators.

Global climate has experienced change in the last few decades. Studies have shown that there will be a continuing trend of climate change. As a result there are ongoing efforts between nations to propose a global policy to mitigate climate change (Global Adaptation Institute, 2011a). Climate change is associated with disasters leading to increased risks. All these incur higher costs for businesses, complicate political decisions, and of most concern, threaten the quality of life for vulnerable populations around the world. Both public and private sector involvements are essential to build a resilient community.

Water has been one of the focus areas of the Global Adaptation Institute. There have been attempts to define various indicators on the water usage. These indices quantitatively evaluate water resource vulnerability. The criteria of assessment may be driven by both policy decisions as well as scientific decisions. The indicators that are most popularly used can be divided into three broad categories: indices proposed on the basis of Human Water Requirements, Water Resources Vulnerability Indices and Indices incorporating Environmental Water Requirements. The most common indices use to measure water stress and scarcity include Falkenmark Indicator, the Social Water Stress Index, the Index of Local water use and re-use, the watershed sustainability index, the water supply stress index and Physical & Economical Water Scarcity.

The current research aims to use remote sensing and GIS to:
• Develop sustainable agriculture index for the regions of Srilanka
• Develop sustainable water indices for the regions in Srilanka
• Compare and correlate the indices with the results from other CECAR-ASIA projects

• *Current Work (II): Nexus of Health and Development: A study using night-time satellite images*
Institute of Advanced Studies for Sustainability

United Nations University
Ongoing

Abstract and Results: Health and development are intricately related. Although India has made significant progress in the last few decades in health sector and overall growth in GDP, there are still large regional differences in both health and development. The main objective of this research is to develop techniques for the prediction of health indicators for all the districts of India and examine the correlations between health and development. Level of electrification and District Domestic Product (DDP) are considered as two fundamental indicators of development in this research. These data along with health metrics and the information from two night-time satellite images were used to propose models. These successfully predicted the health indicators with less than $7 - 10\%$ error. Chosen health metrics such as Crude Birth Rate (CBR) and Maternal Mortality Rate (MMR) were mapped for the whole country at the district level. These metrics showed very strong correlation with development indicators (correlation coefficients ranging from 0.92 to 0.99 at the 99% confidence interval). This is the first attempt to use the VIIRS (satellite) imagery in a socio economic study. This research endorses the observation that areas with higher DDP and level of electrification have overall better health conditions.

India being such a vast country, data on health are officially collected from a sample of population from nine states only. The method used in this paper will be useful to predict health metrics for micro regions for the country as a whole. This disaggregated data will be of immense importance for rural development and micro-level planning.

• *Title of Thesis for Doctor of Philosophy: Assessing the utility of DMSP-OLS night time images to propose a surrogate census.*
School of Mathematical and Geospatial Sciences
RMIT University, Melbourne
Completed: August, 2011
Thesis Abstract: Countries, such as India, conduct a census collection every ten years. Currently census in India is carried out manually with enumerators visiting every household in the country. Being such a vast country (in terms of area) and with a population of more than 1 billion, manual data collection is a laborious and an expensive process. The census suffers from a number of shortcomings including inconsistency issues, the Modifiable Areal Unit Problem (MAUP) and large temporal acquisition timeframes. Although, the provisional population figures are published in the same year of census enumeration, the final tables require more than a year for processing and publication. This thesis proposes a surrogate method for collecting key census metrics using satellite images which help overcome some of these problems such as the prediction of census metrics more frequently than available now. This in turn should help population policy making and development planning.

Satellite images from the Operational Linescan System (OLS) onboard the Defense Meteorological Satellite Program (DMSP) group of satellites were used for the study. Unlike other passive remote sensing sensors, this sensor is capable of recording the emissions from artificial lights on the earth surface. Radiance calibrated images and stable light products from DMSP - OLS satellite captured in 2001 were used in this study. The year corresponded with the year of the last available full Indian census. The study looks into the state of Maharashtra in western India.

The study is broadly divided into three parts. The data processing section of the thesis describes the pre-processing of the census and satellite datasets used in this research and the various data quality issues that were encountered The statistical tests conducted include the process of sampling, tests for normal distribution (histogram, skewness – kurtosis and goodness of fit test) and bootstrapping the correlation coefficients. Ten census metrics were shortlisted which were used for proposing a surrogate census. The next part of the research examines models to propose census metrics from non – composited fixed gain radiance calibrated images. Two fixed gain images were used: a low gain image with gain setting of 20 dB and a high gain image with gain setting of 50 dB. It was found that fixed gain images with a gain of 50 dB were suitable for districts. Part 3 of the study used the global composite stable light images and brightness images for the year 2001 to propose surrogate census for areas at different spatial scales. At the district level, correlations between stable lights and brightness information with available census metrics

from the last Indian census (2001) were calculated using bootstrapping techniques. Linear regression and multivariate analyses were subsequently performed and models proposed for each of the selected census metrics with results ranging from r2 of 0.8 to 0.9 at the 95% confidence interval. Census metrics unavailable at spatial scales lower than districts were also predicted using the proposed models and maps were derived showing the predicted measures. At Taluks the adjusted r2 values range from 0.2 to 0.8 at 95% confidence interval, with the majority of the metrics being moderately correlated (with r2 between 0.4 and 0.7). Generally it was found that the observed lights and brightness of big rural settlements from DMSP-OLS images have the potential for predicting certain census metrics. However, unlike larger areas such as districts where DMSP-OLS night-time images adequately predict census metrics, at the sub-district level the results need to be supplemented and validated with other information sources such as survey reports. There were no significant correlations noted at the village level, the reason being attributed to sampling issues.

The thesis concludes with a comparative assessment of the models and the utility of the DMSP-OLS night-time images in proposing census. The method proposed in this research will enable prediction of census metrics more frequently and determine the trends of change over the inter-censal periods.

• Mapping socio-economic variables at six local government areas around Melbourne.
School of Global Studies
RMIT University, Melbourne
Completed: August, 2008
Project description: In this project I worked as a research assistant and was responsible for creating the database in MS Access, vectorization of the map, attaching the database, creation of thematic maps and creation of layouts. The project shows the difference in the levels of socio-economic development in Bass Coast, Surf Coast, Moorabool, Murridindi, Mitchell and Macedon Ranges. It also studied the temporal changes of the different parameters. The layouts with the thematic maps showing the results were saved in jpeg format and inserted into the report.

• Detecting temporal change in land use during last 30 years i.e. 1975 – 2005 using images from various types of sensors of different times and making a database of the retrieved and manipulated data
Computer Aided Design Centre
Jadavpur University, Kolkata
Completed: January 2006
Project description: Classifying images of different times from various sensors like MSS, TM, ETM+, LISS – III, LISS – IV of various spectral and spatial resolutions. Identifying behavior of land use and making a comparison to detect the trend of changing land use, taken place during the last 30 years in particular area of Kolkata Municipal Corporation.

• Roof classification from Aerial photos
Ordnance Survey
United Kingdom
Completed: September 2007
Project Description: Accurate roof morphologies are required in many applications like rain-runoff modeling and by the telecommunications industry. Since all aspects of the buildings cannot be captured from the air, the roofs are taken as simpler and analogous set of classes which can be divided into a number of classes depending on a number of criteria. Here the different bases by which roofs can be classified have been explored using both image processing and photogrammetric techniques. The roofs present a complex nature when classified on the basis of their reflectance properties using unsupervised classification. They are also classified on the basis of their area, heights above ground, slope, morphology, number of surfaces etc. These properties are obtained from the DSM created using stereopairs. The study deals with the roofs of Avonmouth area of Bristol. The data has been provided by Ordnance Survey, the National Mapping Agency of UK. This work deals with finding the classes of roofs as well as validating the result. The accuracy assessment of the classification shows 80.33%.

• Rural development: Impact of family income and female education on Infant morbidity: Case Study of

two villages in Bishnupur Block I, South 24 Parganas, West Bengal
University of Calcutta
Completed: April 2004

• *Jalpaiguri Town: A study in Urban Perspectives*
University of Calcutta
Completed: April 2004

• *Leicestershire County Council, UK*
Nature of Project : Digitization and Data Entry
Software : Map Info 8.0/8.5
Project Description: This is part of the 1st phase of the work being carried on by Historic and Natural Environment division of Leicestershire County Council in North West Leicestershire.
Contribution: Digitizing some features and input of landuse, main points, hedges and other features in the mastermap.

SKILL SUMMARY:

Certification:
• Certificate of Participation in NIIT: C++ and Advanced Java
GIS Software Skills:
• Specialized knowledge and understanding of Map Info (versions 9 and 10), Arc Info (versions 8 and 9), Statistica (versions 8 and 9)
• Applied knowledge in SPSS 18.
• Applied knowledge in Feature Manipulation Engine (FME).
• DBMS (SQL) and MS Access

GIS and Remote Sensing Software Skills:
• Specialized and applied knowledge in Arc Information, Erdas Imagine (versions 8 and 9), Bentley Microstation

Writing and Communication:
• Experience in teaching GIS and Remote Sensing in Sarsuna College, Ashutosh College, RMIT University and Jawaharlal Nehru Technological University, Hyderabad, India.
• Experience in teaching in practical classes in GIS and remote sensing labs in Ashutosh College and RMIT University.
• Experience in dealing with Map Information, statistics and SPSS. Examples in the Project section
• Comprehensive problem solving, good verbal and written communication skills. Examples in the Publications section.

Computers:
• Operating System: Windows (all), Mac Osx (10.8, 10.9)
• Proficient softwares: MS Office, MS Front Page, MS Access.

REFEREES:
Available on request.

PERSONAL DETAILS:
Father's Name: Dr. Dipak Roychowdhury
Date of Birth: 16th November, 1980
Marital Status: Single
Nationality: Indian
Languages known: English, Hindi, Bengali.