Dr. Uma Rajarathnam

1	**Current position**		**Head, Applied Research and Collaboration**
2	**Name of Firm**		Enzen Global Solutions Pvt. Ltd.
3	**Name of Staff**		**Dr. Uma Rajarathnam**
4	**Date of Birth:** July 30, 1967		**Nationality**: Indian
5	Education		
	Name of College/University/Institution	Degree/Diploma obtained	Date of degree/diploma obtained
	Said Business School, Oxford University, UK	Innovation, Science and Leadership fellowship	2017
	Global School of Business, Stanford University, USA	Stanford Executive Program	2015
	Center for Energy Studies, Indian Institute of Technology (IIT), Delhi	PhD	2005
	Bharathidasan University, Tiruchirapalli, India.	M.Sc, Environmental sciences	1989
	Bharathidasan University, Coimbatore, India	B.Sc, Biochemistry	1987
6**. Membership of Professional Associations**: (add rows if needed)		Member, National Air Pollution Association, Delhi	
		Member, International Society of Environmental Epidemiology	
7. **Areas of Specialization**		Institution and Governance	
		Policy advocacy and strategy	
		Climate change and sustainability	
		Environmental Health and Exposure assessment	
		Corporate Social Responsibility	
8. **Recognitions**		1. **Temporary advisor for World Health Organization** in developing air quality guidelines, 2005. 2. Awarded Fulbright IAELP (**Indo American Environmental Leadership Program**) Fellowship during 2003. 3. Awarded **Chevening Rolls-Royce Innovation Science and Leadership Fellowship (CRISP)** by British Common wealth office and Rolls-Royce, 2017	
9. Countries of Work Experience:		India, United States, United Kingdom	
10. Languages:			

Language	Speaking	Reading	Writing
English	Good	Good	Good
Hindi	Good	Good	Good
Tamil	Good	Good	Good
Kannada, Malayalam	Fair	Fair	Fair
Computer packages known		Level of competence	
MS Office		Good	

11. Employment Record			
Employment		**Employer**	**Position held**
From	*To*		
December 2015	Till Date	Enzen Global Solutions Private Limited, Bangalore	Head, Applied Research and Collaborations
August 2007	December 2015	Enzen Global Solutions Private Limited, Bangalore	Head, Clean Energy and Environment Practice
May 2006	August 2007	The Energy and Resources Institute, Southern Regional center, Bangalore	Fellow and Area Convener
April 2001	April 2006	The Energy and Resources Institute, Southern Regional center, New Delhi	Fellow and Area Convener
July 1994	Mar 2001	The Energy and Resources Institute, New Delhi	Research Associate
May 1992	July 1994	National Environmental Engineering Research Institute (NEERI), Delhi	Senior Project Fellow
May 1989	May 1992	Bishop Heber College, Tiruchirapalli	Technical Assistant

12. Detailed Tasks Assigned The specific tasks to be performed by the proposed Subject Expert:	**Work Undertaken that Best Illustrates Capability to Handle the Tasks Assigned**
12.1 Institution and Governance	Uma has worked on various projects related to Institutional strengthening and Governance. Key projects include strengthening of state pollution control board (regulatory agency), study the energy, water and irrigation nexus, Assessment of policy gaps in addressing indoor air pollution, Study on Urban air pollution and health. Identifying and mapping key stakeholders in addressing indoor air pollution. Developing standards and guidelines for vertical shaft brick kilns, study on air pollution from brick kilns, Eco health approach to study the linkage between air pollution and health in Mining areas.
12.2 Policy Advocacy	She has over 22 years of rich experience in providing expert

	solutions and advisory services in the fields of climate change, environmental impacts, renewable energy and energy efficiency. She has worked on various assignments with international bodies namely Intergovernmental Panel on Climate Change (IPCC), United Nation Framework Convention on Climate Change (UNFCCC), World Health Organization (WHO) The World Bank and United States Environmental Protection Agency (USEPA). She has been working to make a marked difference in increasing awareness at a holistic level on renewable energy and energy efficiency, environment and climate change and is proactively influencing public policy making.
12.3 Strategy	Uma has experience of advising strategy related projects including the one recently done for Shakti Sustainable Energy Foundation. The objective of this research study was to carry out a comprehensive assessment of materials used for wall construction in India. She has been an advisor for more than ten carbon management assignments, low carbon business plans, carbon footprint and reduction strategy assignments for large Energy Utilities and County councils of UK and few manufacturing industries in India.
12.4 Stakeholder engagement	Uma advised on implementing rural power generation projects falling under Micro-Hydro category at five villages. The assignment was for Karnataka Rural Water Supply and Sanitation Agency established under Rural Development & Panchayat Raj Department, Government of Karnataka. Potential energy of a running stream is converted into electrical energy with the sole target of Development of Rural Areas and Social upliftment of the villagers. Such (with a power rating of 5kW to 100 KW) allows especially the remote and rural areas to leverage one of their most valuable and underutilized renewable energy sources. The project was recognized and awarded at **India Power Awards 2010** under the category of Social & Community Impact.
12.5 Technical expertise	She leads a team of experts providing energy and environmental services on a global level. Her field expertise is of immeasurable value creating a foreground to bring about clean technology innovation. Her recent project portfolio includes 'Clean Development technology and a first of its kind study "Black carbon emissions measurement from brick kilns in India" – funded by Shakti Foundation. She was involved in "Development of Environmental Standards, Stack Height Regulations and Good Practices for vertical shaft brick kilns in India", sponsored by Central Pollution Control Board, India. As Co- Investigator she was involved in estimation of SO2 and black carbon emissions in India. She has experience in development of Environmental Standards, Stack Height Regulations and Good Practices for Producer Gas Plants and biomass gasifiers. She has lead the team on Action research programme on improvement of energy-environment efficient technology in Brick kilns. She has worked on "Evaluation of air

	pollution control technologies of brick kilns in India", sponsored by Central Pollution Control Board, India.
12.6 Business Innovation and risk management	Her recent engagements include implementing the Agricultural Demand Side Management (Ag-DSM) project at three locations in Southern India for State owned utility companies of Karnataka. The project had an objective of overcoming the ongoing power crisis considering environmental constraints, plugging inefficiencies and evaluating the best possible alternatives to boost agricultural productivity. The activity involved replacing 600 pump sets with BEE star rated highly energy efficient pumps to ensure Demand Side Management of electricity leading to availability of power in henceforth power deficient areas and also empowerment of farmers of the area under consideration. It presented a risk-sharing model on turn-key basis, where the returns were calculated based on amount of resources saved along with providing operational, monitoring and maintenance support. Currently she is implementing another such kind of project at Hubli sub-divisional areas of Nippani and Byadgi of HESCOM (Hubli Electricity Supply Company Limited), Karnataka. Enzen is replaceing the existing inefficient pump sets with BEE star rated energy efficient pump sets. The replacement of 255 pump sets in Nippani region and 335 pump sets in Byadgi region will ensure demand side management of electricity that will make the power available in power deficient areas. All of these aspects were strengthened with Uma's strong Social Engineering techniques to create the much required boost to gain better outcome. This endeavor was duly recognized and Awarded during the India Power Awards by the eminent panel of India Power Awards Committee & Mercados EMI under the Energy Efficiency & Demand Side Management Category. The project also won the highly prestigious '**Platts Award for Excellence' 2012** under "Energy Efficiency – Energy Supplier" award.
12.7 Awards and recognition	• Her contribution to climate change research was recognized as a contributing activity towards the UN International Panel for Climate Change (IPCC) winning the **Nobel Peace Prize in 2007**. • She has been awarded with Fulbright Indo American Environment leadership Program **(Fulbright-IAELP)** fellowship. • Awarded with Chevening Rolls-Royce Innovation, Science and Leadership (CRISP) fellowship sponsored by Foreign Commonwealth Office, UK, 2017.

List of Air pollution related studies with lead role of Uma

Actively involved in more than 50 completed and ongoing projects as detailed below (list includes projects undertaken in previous organizations):

Air Pollution related projects

Black carbon and air pollution emissions from brick making in India and Vietnam – Three studies (2012-2016) sponsored by Shakti Foundation, India and Clean Air task force, USA.

Environmental assessment and due diligence of Panipat thermal power plant,

Environment Audit & Due Diligence in Respect of Parli Thermal Power Station" Unit- 3 (210 MW) sponsored by Mahagenco, India

Environment Audit & Due Diligence in Respect of Bhusawal Thermal Power Station, Unit-2 (210 MW) sponsored by Mahagenco, India

Survey on Indoor Air Pollution in Karnataka (Kolar, Madikeri, Bangarpet) sponsored by Berkeley Air Monitoring Group, California, USA.

Stakeholder mapping for Indoor Air Pollution in India sponsored by Shell Foundation, UK

Assessment of exposure and health risk to indoor air pollution and water quality in three different regions in India", sponsored by Forgarty International Center, USA.

Source Apportionment of Particulate matter in Bangalore – funded by Indian Oil Corporation Ltd

Comparative risk assessment for interventions aimed at reduction of indoor air pollution associated with bio-mass fuel use in rural and urban settings of Andhra Pradesh, India - an integrated evaluation based on health risks and greenhouse gas emissions", sponsored by USEPA.

Rapid assessment of air pollution in developing countries. sponsored by Swedish Environmental Research Institute, Sweden.

Ambient and indoor air quality at World Health Organization (WHO) building, WHO regional office, New Delhi.

Assessment of indoor air pollution in office building - Paharpur business center, Delhi, Phase II.

Assessment of indoor air pollution in office building-Paharpur business center, Delhi, Phase I.

Air quality monitoring and awareness creation in Delhi – an in-house project supported by The Energy and Resources Institute (TERI), Delhi

Community Adoption and Monitoring Programme for Schools (CAMPS)", sponsored by UNDP, Public Affairs Section, US Embassy.

Estimation of SO_2 and black carbon emissions in India.

Ambient air quality monitoring under National Ambient air quality Monitoring Program (NAMP), Delhi

Action research program on improvement of energy-environment efficient technology in Brick kilns.

Monitoring and assessment of air pollutants from small and medium scale enterprises: Puffed rice making in Karnataka.

Assessment of exposure to indoor air pollution in southern India", sponsored by London School of Hygiene and tropical institute, UK.

Review of past and ongoing work on urban air quality in India", sponsored by The World Bank.

Investigation on respirable particulate and trace elements with source identification in air environment of Korba", sponsored by Ministry of Coal, India.

Evaluation of air pollution control technologies of brick kilns in India sponsored by Central Pollution Control Board, India.

Airpollution and Health Related projects

Time Series study on air pollution and mortality in Delhi, sponsored by Health Effect Institute, Boston, USA.

Impact of regulations on air and health", sponsored by Center for High Technology, Delhi.

Assessment of exposure to indoor air pollution to study the epidemiology of age related macular degeneration – pilot study in Haryana, sponsored by London School of Hygiene and Tropical Medicine, UK.

Valuing the environmental-health linkages from air pollution in mining regions, sponsored by IDRC, Canada.

Survey on air pollution and health, sponsored by Brown University, USA.

Health problems associated with domestic pollution, sponsored by UNEP.

Air pollution and Policy Studies

Policy gaps in household energy, indoor air pollution and health in India", sponsored by Practical Action, Nepal.

Development of Environmental Standards, Stack Height Regulations and Good Practices for Producer Gas Plants and biomass gasifiers.

Development of Environmental Standards, Stack Height Regulations and Good Practices for vertical shaft brick kilns in India", sponsored by Central Pollution Control Board, India.

Global Environmental Outlook-3, sponsored by UNEP.

Looking back to think ahead- Green India (Growth with Resource Enhancement of Environment and Nature), study done by The Energy and Resources Institute (TERI), India

DISHA (Directions, Innovation and Strategies for Harnessing Action – 2047) – In-house project.

Status of Environment Report (SOE) for Bangalore, Karnataka Prepared for Environment Monitoring Policy Research Institute (EMPRI), Bangalore.

Climate change related studies

Carbon management strategy for RIIO business plan, Wales and West Utilities, UK

Carbon management strategy for RIIO business plan, Northern Gas network, UK

Carbon Management plan for St Helens Council, UK

Greenhouse gas emission inventory of Karnataka, series 1: Transport sector, Bangalore, prepared in association with Karnataka State Pollution Control Board.

Greenhouse gas emission inventory of Karnataka, series 2: Transport sector of seven southern districts (Mysore, Mandya, Bangalore Rural, Chamrajnagar, Kodagu, Chikkaballapur and Ramanagara) prepared in association with Karnataka State Pollution Control Board.

Clean Development Mechanism project development for waste gas utilization project with Sunflags Ltd.

Clean Development Mechanism project development for Biofuel utilization project with Raghuvar India Limted, Haryana, India

Clean Development Mechanism project development for Biofuel utilization project with Kontak Comforts Ltd, Pune, India

Clean Development Mechanism project development for Energy efficiency improvement in Street lighting for Madurai Municipal Corporation being implemented by Salzar electrical, Tamilnadu.

Clean Development Mechanism project development for 3 MW solar power project in Bellary – Karnataka Power Corporation limited (KPCL), Karnataka.
Clean Development Mechanism project development for 1600 MW super critical power project in Edlapur – Karnataka Power Corporation limited (KPCL), Karnataka.

Clean Development Mechanism project development for 1600 MW super critical power project in Ermarus – Karnataka Power Corporation limited (KPCL), Karnataka.

Greenhouse gas emission and health damaging pollutants from small - scale combustion devices in Developing Countries", sponsored by USEPA**.**

Non Energy Use and CO_2 emissions – Phase III, sponsored by European Union.
Non Energy Use and CO_2 emissions – Phase II, sponsored by European Union.

Non Energy Use and CO_2 emissions – Phase I", sponsored by European Union

Workshops / Conferences organized

1. Zen dialogue on "Future of Electricity Utility"

2. "Regional workshop on climate change and health", sponsored by World Health Organization-South East Asia Regional Office, New Delhi.

3. "Workshop on Rapid Assessment of Air pollution", sponsored by SIDA, Sweden.

4. "Workshop on Atmospheric Brown Cloud", sponsored by UNEP.

5. "Regional workshop on Indoor air pollution", sponsored by The World Bank.

International conferences / meetings participated

1. Panelist at Clean Cooking Forum, 2017, Organized by Global alliance for clean cook stoves in Delhi, 2017

2. Sustainable Futures: Research Policy and Practice organized by Newcastle University in London, 2016
3. Sustainable Energy for All conference organized by ADB, Manila, June, 2016
4. Panelist at workshop on “Energy and Poverty” organized during the 31st annual conference of International Association of Energy Economics held in Istanbul, Turkey, June 2008.
5. Participated and presented a paper at Annual conference of Health Effects Institute held in Philadelphia, USA, April, 2008
6. Participated “Global Environmental Health Forum” organized by National Institute of Environment and Health, USA in Bethesda, USA, September 2007
7. “Time series study on air pollution and mortality in Delhi”, poster presented in Annual conference of Health Effects Institute held in Chicago, USA, April 2007.
8. Partnership meeting on Indoor air pollution Organized by USEPA in Bangalore, March, 2007.
9. Presented paper titled “Policy gaps on Household energy indoor air pollution and health studies in India” at the Regional workshop organized by the Practical Action, Nepal, February 2007.
10. Panelist in a technical session on “Air pollution and Health” at the Better Air Quality Workshop, Indonesia, 2006
11. Presented a poster at the Annual conference of Health Effects Institute, San Francisco, USA, April 2006.
12. Air Quality Guidelines Meeting organized by WHO- Europe in Bonn, Germany during October 2005.
13. Meeting on Public Health Air Pollution in Asian Cities organized by Health Effects Institute in Hong Kong, November 2005.
14. Partnership meeting on Indoor air pollution organized by USEPA in Morocco, March 2005.
15. “Time series study on air pollution and health in Delhi”, poster presented in Annual conference of Health Effects Institute at Baltimore, USA, April 2005.
16. Presented paper on, “Indoor air pollution and its linkages with socio economic factors” in the Socio Economic Linkages Workshop organized by the International Society of Environmental Epidemiology (ISEE) during October 2003 at Perth, Australia.
17. Attended workshop organized by UNFCCC to elaborate draft technical guidance on methodologies for adjustment under article 5, paragraph 2 of Kyoto protocol (second adjustment workshop) at Lisbon, Portugal 2003.
18. Attended workshop organized by UNFCCC to elaborate draft technical guidance on methodologies for adjustment under article 5, paragraph 2 of Kyoto protocol (first adjustment workshop) at Athens, Greece, April 2002.
19. Presented a paper on “Indoor air pollution and Health” in the workshop organized by the International Society of Environmental Epidemiology (ISEE) during September 2001 at Germany.
20. Completed one week training workshop in "Understanding Urban Air Pollution and Role of Diesel Particles" organized by University of California & Centre for Occupational and Environmental health during 6-11 November 2000.
21. Expert meeting on “Wood Energy, Climate & Health” organized by FAO at Phuket, Thailand, on 7 – 9, October, 1999.

22. Training on “Occupational and Environmental Health" organized by Center for Occupational and Environmental Health, Delhi in collaboration with International Center for Research and Training, USA during 15th-20th November 1999.

23. Expert meeting on managing uncertainty in emission inventory – Energy Sector Organized by IPCC and OECD at Prague, Czech Republic during May 1999.

24. Workshop on Emission factor and Activity Data Organized by UNFCCC during COP4, held in Argentina 1998.

25. Expert Group meeting organized by IPCC on managing uncertainty in National Greenhouse Gas Inventories held in Paris, 1998.

26. Workshop on Emission Factor and Activity Data Organized by IPCC and UNFCCC at Havana, CUBA during September, 1998.

Publications

Presented more than 20 papers in Conferences / Seminars.

In Journals

1. Uma Rajarathnam, Vasudev Athalya, Santhosh Raghavan, S Maithel, D Lalchandani, Ellen Baum, Cheryl Wayant and Tami Bond, Assessment of air pollutant emissions from Brick kilns, Atmospheric Environment, 2014

2. R. Uma, T.C. Kandpal and V.V.N. Kishore, Emission characteristics of small-decentralized power generation system operated in diesel alone and dual fuel mode, *Biomass & Bioenergy*, 2004.

3. P. Monkkonen, R. Uma, D. Srinivasan, I.K. Koponen, R. Suresh, V.P. Sharma, and M. Kulmala, Relationship and Variation of aerosol number and PM10 mass concentrations in a highly polluted urban environment, *Atmospheric Environment*, 38 (2004) 425-433

4. P. Monkkonen, I.K. Koponen, R. Uma, and M. Kulmala, Measurements in a highly polluted Asian Mega city: observations of aerosol number size distribution, modal parameters and nucleation events, *Atmospheric Chemistry and Physics Discussion*, 4, 1–25, 2004

5. Sawant, R. Uma, D. Sharma and D.R. Cocker, 2003, Preliminary chemical characterization of particle phase organic compounds in New Delhi, India, *Atmospheric Environment*, 37, 4317-4323

6. K.R. Smith, R. Uma, V.V.N. Kishore, K. Lata, J. Zhang, R.A. Rasmussen, M.A.K. Khalil and S.A. Thorneloe, Green House gases from Small scale combustion devices in developing countries, Phase II a : Household stoves in India, *U.S Environmental Protection Agency Office of Research and Development, Washington D.C EPA-600/R-00-52* (This is also posted in US EPA website), 2000.

7. K.R. Smith, R. Uma, V.V.N. Kishore, Junfeng Zhang, V. Joshi and M.A.K. Khalil, Greenhouse implications of household fuels: An analysis for India, Annual Review of Energy and Environment, Volume 25, 2000.

8. S. Maithel and R. Uma, Environmental Regulations and Indian Brick Industry, *Environmental Practice*, Vol.2 , No3, Oxford University Press, 2000.

9. J..Zhang, K.R. Smith, R. Uma, Y. Ma, V.V.N. Kishore, K. Lata, M.A.K. Khalil, R.A. Rasmussen, and S.T. Thorneloe, Carbon monoxide from cookstoves in developing countries: 1 emission factor, Chemosphere: Global Change Science, 1 (1999) 353-366

10. J. Zhang, K.R. Smith, R. Uma, Y. Ma, V.V.N. Kishore, K. Lata M.A.K. Khalil, R.A. Rasmussen, and S.T. Thorneloe, Carbon monoxide from cookstoves in developing countries: 2 Potential chronic exposure, Chemosphere: Global Change Science, 1 (1999) 367-375.

11. R.K. Prasad, R. Uma, A. Kansal, S. Gupta and S. Saksena, Indoor Air Quality in an Air-conditioned Building in New Delhi and its Relationship to Ambient Air Quality, MAPAN - Journal of Metrology Society of India, Vol. 12, No. 2-4, pp. 249-252, 1997.

12. R. Uma and N. Balasubramanian (1996), Removal of chromium from synthetic effluent using adsorption technique, Energy Environment Monitor, Volume 12, No. 1.

13. N. Rajarathnam and R. Uma (1996), Estimation of Air Pollution due to jet aircraft engine emission at Bombay airport, Energy Environment Monitor, Volume 12, No. 2.

14. R. Uma and N.T. Kim Oanh, Measuring Stove Emissions (8-9), Wood Energy News / Regional Wood Energy Development Programme in Asia (GCP/RAS/154/NET), Vol 14, No. 3.

Popular Publication

Greenhouse Gas Inventory of Karnataka, Series 1: Bangalore city: Road transport sector, report prepared by Enzen Global in association with Karnataka State Pollution Control Board, January 2008