Nawa Raj Baral
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Education

- **October, 1998 to August 2001** **:** Diploma in Mechanical Engineering, Tribhuvan University, Nepal
- **August 2002 to October 2006** **:** BE in Mechanical Engineering, Tribhuvan University, Nepal
- **November 2006 to April, 2009** **:** MSc. in Renewable Energy Engineering, Tribhuvan University, Nepal
- **January 2014 to December 2016** **:** Ph.D. in Food, Agricultural and Biological Engineering, The Ohio State University, USA

Employment Experiences

- **October, 2006 to September 2009** : Lecturer, Advance College of Engineering & Management, Kupondole, Lalitpur, Nepal
- **October, 2009 to November 2011** : Lecturer, Department of Mechanical Engineering, Institute of Engineering, Pulchowk, Lalitpur, Nepal
- **November 2011 to August 2012** : Assistant Professor, Department of Mechanical Engineering, Institute of Engineering, Pulchowk, Lalitpur, Nepal
- **August 2012 to December 2013** : Researcher, Harbin Institute of Technology, Harbin, China
- **February 2017 to December 2017** : Postdoctoral Fellow, Mechanical Engineering, Colorado State University, USA
- **December 2017 to June 2020** : Postdoctoral Fellow, Lawrence Berkeley National Laboratory, USA
- **July 2020 to May 2023** : Project Scientist, Lawrence Berkeley National Laboratory, USA
- **May 2023 to Present** : Research Scientist, Lawrence Berkeley National Laboratory, USA

Research Grants

September, 2024: Leveraging Circular Bioeconomy through Regional Biomass Intermediates Depots (Bio-BIDs), BETO, DOE. **$2,365K**

Area of Specialization

Process modeling; Techno-economic analysis (TEA), and life-cycle assessment (LCA) (evaluation of social, economic, and environmental impacts, water footprint, and water-energy-food nexus) of biobased/renewable/-alternative energy systems. Experimental works on biomass pretreatment, fermentation, and separation.

Research Interests and Focus Areas

- Supply Chain and Value Chain Analysis of Terrestrial and Aquatic Biomass
- Conversion of Terrestrial and Aquatic Biomass to Biofuels, Biochemicals, and Biomaterials
- Carbon Capture and Sequestration/Conversion to eFuels and eChemicals
- Hydrogen Production, Storage, Supply, and End-Use Applications
- Battery Production and End-Use Applications
- Climate Change and Its Impacts on Soil Health, Food, Feed, and Water Resources

Awards and Honors

2024: BioResources Early Career Investigator Award, https://bioresources.cnr.ncsu.edu/features/biores-early-career-investigator-award/.
2021: Spot Award, TEA work on biofuels and bioproducts, The Joint BioEnergy Institute, Lawrence Berkeley National Laboratory, USA.
2019: 2019 Outstanding Publication Award, The Joint BioEnergy Institute, Lawrence Berkeley National Laboratory, USA.
2018: 2018 Feedstock/ Life-cycle, Economics, and Agronomy Division (LEAD) Excellent Research Award, The Joint BioEnergy Institute, Lawrence Berkeley National Laboratory, USA.
2016: FABE Graduate Research Award in PhD category, Department of Food Agricultural and Biological Engineering, The Ohio State University, USA.
2009: Gold Medal, MSc. In Renewable Energy Engineering, Tribhuvan University, Nepal.

Selected Publications (from over 50 publications; h-index: 23, i10-index: 34)

1. **Baral, N.R.,** Kavvada, O., Pereza, D.M., Mukhopadhyay, A., Lee T.S., Simmons, B.A., Scown, C.D. (2019). Techno-economic analysis and life-cycle greenhouse gas mitigation cost of five potential jet fuel molecules. Energy & Environmental Science. 12(3), 807-824.

2. **Baral, N.R.**, Yang, M., Harvey, B. G., Simmons, B. A., Mukhopadhyay, A., Lee, T. S., & Scown, C. D. (2021). Production cost and carbon footprint of biomass-derived dimethylcyclooctane as a high-performance jet fuel blendstock. ACS Sustainable Chemistry & Engineering, 9(35), 11872-11882.

3. Gautam, S., **Baral, N.R.**, Mishra, U., & Scown, C. D. (2023). Impact of bioenergy feedstock carbon farming on sustainable aviation fuel viability in the United States. Proceedings of the National Academy of Sciences, 120(51), e2312667120.

4. **Baral, N.R.**, Banerjee, D., Mukhopadhyay, A., Simmons, B. A., Singer, S. W., & Scown, C. D. (2024). Integration of Genome-Scale Metabolic Model with Biorefinery Process Model Reveals Market-Competitive Carbon-Negative Sustainable Aviation Fuel Utilizing Microbial Cell Mass Lipids and Biogenic CO2. BioResources, 19(3), 4056-4086.

5. **Baral, N.R.**, Kavvada, O., Mendez-Perez, D., Mukhopadhyay, A., Lee, T.S., Simmons, B. and Scown, C.D. (2019). Greenhouse Gas Footprint, Water-Intensity, and, Production Cost of Bio-Based Isopentenol as a Renewable Transportation Fuel. ACS Sustainable Chemistry & Engineering, 7(18), 15434-15444.

6. **Baral, N. R.**, Banerjee, D., Mukhopadhyay, A., Simmons, B. A., Singer, S. W., & Scown, C. D. (2023). Economic and Environmental Trade-Offs of Simultaneous Sugar and Lignin Utilization for Biobased Fuels and Chemicals. ACS Sustainable Chemistry & Engineering.

7. **Baral, N.R.**, Mishra, S.K., George, A., Gautam, S., Mishra, U., and Scown, C.D., 2022. Multifunctional Landscapes for Dedicated Bioenergy Crops Lead to Low-Carbon Market-Competitive Biofuels. Renewable and Sustainable Energy Reviews, 169, 10.1016/j.rser.2022.112857.

8. **Baral, N.R.**, Sundstrom, E.R., Das, L., Gladden, J., Eudes, A., Mortimer, J.C., Singer, S.W., Mukhopadhyay, A. and Scown, C.D. (2019). Approaches for More Efficient Biological Conversion of Lignocellulosic Feedstocks to Biofuels and Bioproducts. ACS Sustainable Chemistry & Engineering, 7(10), 9062-9079.

9. Nordahl, S. L., **Baral, N. R.**, Helms, B. A., & Scown, C. D. (2023). Complementary roles for mechanical and solvent-based recycling in low-carbon, circular polypropylene. Proceedings of the National Academy of Sciences, 120(46), e2306902120.

10. **Baral, N.R.**, Dahlberg, J., Putnam, D., Mortimer, J.C., & Scown, C.D. (2020). Supply Cost and Life-Cycle Greenhouse Gas Footprint of Dry and Ensiled Biomass Sorghum for Biofuel Production. ACS Sustainable Chemistry & Engineering, 8(42), 15855-15864.

11. **Baral, N. R.**, Quiroz-Arita, C., & Bradley T.H. (2018). Probabilistic Lifecycle Assessment of Butanol Production from Corn Stover Using Different Pretreatment Methods. Environmental Science & Technology. 52(24), 14528-14537.

12. **Baral, N. R.**, Quiroz-Arita, C., & Bradley T.H. (2017). Uncertainties in Corn Stover Feedstock Supply Logistics Cost and Life-cycle Greenhouse Gas Emissions for Butanol Production. Applied Energy, 208, 1343-1356

13. **Baral, N. R.**, Asher. Z., Trinko, D., Quiroz-Arita, C., Sproul, E., Quinn, J., & Bradley T.H. (2020). Economic and environmental impacts of hybrid and electric trucks on biomass feedstock supply system for cellulosic biorefineries. Journal of Cleaner Production, 279, 123593.

14. Dou, C., Choudhary, H., Wang, Z., **Baral, N.R.**, Mohan, M., Aguilar, R.A., Huang, S., Holiday, A., Banatao, D.R., Singh, S. and Scown, C.D. (2023). A hybrid chemical-biological approach can upcycle mixed plastic waste with reduced cost and carbon footprint. One Earth, 6(11), 1576-1590.

15. Demarteau, J.,Cousineau, B., Wang, Z., Bose, B., Cheong, S., Lan, G., **Baral, N.R.**, Teat, S.J., Scown, C., Keasling, J.D., Helms, B.A. (2023). Biorenewable and circular polydiketoenamine plastics. Nature Sustainability, 6(11), pp.1426-1435.

16. Vora, N., Christensen, P.R., Demarteau, J., **Baral, N.R.**, Keasling, J.D., Helms, B.A., Scown, C.D. (2021). Leveling the cost and carbon footprint of circular polymers that are chemically recycled to monomer. Science Advances, 7(15), p.eabf0187.

17. Scown, C. D., **Baral, N.R.**, Tanjore, D., & Rapp, V. (2023). Matching diverse feedstocks to conversion processes for the future bioeconomy. Current Opinion in Biotechnology, 84, 103017.

18. Yang M., **Baral N. R.**, Simmons B.A., Mortimer J.C., Shih P.M., Scown C.D. (2020). Accumulation of high-value bioproducts *in planta* can improve the economics of advanced biofuels. Proceedings of the National Academy of Sciences, 117(15), 8639-8648.

19. Yang, M., Liu, D., **Baral, N. R.**, Lin, C. Y., Simmons, B. A., Gladden, J. M., Eudes, A. & Scown, C. D. (2022). Comparing in planta accumulation with microbial routes to set targets for a cost-competitive bioeconomy. Proceedings of the National Academy of Sciences, 119(30), e2122309119.

20. Wang, Y., **Baral, N.R.**, Pieja, A.J.,Yang, M., Scown, C.D. (2023). Co-processing agricultural residues and wet organic waste can produce lower-cost carbon-negative fuels and bioplastics. Environmental Science & Technology, 57(7), 2958-2969.

21. Magurudeniya, H.D., **Baral, N.R.**, Rodriguez, A., Scown, C.D., George, A., Simmons, B.A., Gladden, J.M. (2021). Ensiled Biomass Increases Ionic Liquid Pretreatment Efficiency and Reduces Biofuel Production Cost and Carbon Footprint. Green Chemistry, 23(8), 3127-3140.

22. Achinivu, E. C., Frank, S., **Baral, N. R.**, Das, L., Mohan, M., Otoupal, P., & Gladden, J. (2021). Alkanolamines as Dual Functional Solvents for Biomass Deconstruction and Bioenergy Production. Green Chemistry, 23(21), 8611-8631. DOI:10.1039/D1GC02667D.

23. Yang, M., **Baral, N. R.**, Anastasopoulou, A., Breunig, H. M., & Scown, C. D. (2020). Cost and Life-Cycle Greenhouse Gas Implications of Integrating Biogas Upgrading and Carbon Capture Technologies in Cellulosic Biorefineries. Environmental Science & Technology, 54(20), 12810-12819.

24. Quiroz-Arita, C., Sheehan, J.J., **Baral, N.R.,** Hughes, A., Peers, G., Sharvelle, S., & Bradley T.H. (2018). A Cyanobacterial Sidestream Nutrient Removal Process and Its Life Cycle Implications. BioEnergy Research, 12(1), 217-228.

25. Huntington, T., **Baral, N.R.**, Yang, M., Sundstrom, E., Scown, C.D. (2023). Machine Learning for Surrogate Process Models of Bioproduction Pathways. Bioresource Technology, 370, 128528.

26. Scown, C. D., **Baral, N. R.**, Yang, M., Vora, N., & Huntington, T. (2021). Technoeconomic analysis for biofuels and bioproducts. Current Opinion in Biotechnology, 67, 58-64.

Patent

1. Magurudeniya, H. D., Rodriguez, A., **Baral, N. R.**, Simmons, B. A., & Gladden, J. M. (2021). U.S. Patent Application No. 17/242,256.

Technical Skills

- *Process modeling software for techno-economic analysis*: Proficient in SuperPro Designer, and working knowledge of Aspen Plus and Simio
- *Process modeling software for life-cycle assessment:* Open LCA and GaBi
- *Process automation:* Fully automated techno-economic analysis using Visual Basic programming language (integrates SuperPro model and Microsoft excel) and custom-built lifecycle assessment model using Visual Basic programming language, and custom-built Python based techno-economic analysis model
- *Developer of BioC2G TEA/LCA Tool (*lead.jbei.org)

- *Other commonly used software*: MATLAB, AutoCAD, and MS Office suite

Professional Service

- **Associate Editor,** Frontiers in Energy Research, section Bioenergy and Biofuels

Professional Membership

- American Chemical Society
- American Society of Agricultural and Biological Engineers