

Stanford



Michael Lepech

Associate Professor of Civil and Environmental Engineering and Senior Fellow at the Woods Institute for the Environment

CONTACT INFORMATION

- **Administrator**

Emilia Alex - Program Administrator

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Bio

BIO

Professor Lepech's research focuses on the integration of sustainability indicators into engineering design, ranging from materials design, structural design, system design, to operations management. Such sustainability indicators include a comprehensive set of environmental, economic, and social costs. Recently his research has focused on the design of sustainable high performance fiber-reinforced cementitious composites (HPFRCCs) and fiber-reinforced polymers (FRPs), the impacts of sustainable materials on building and infrastructure design and operation, and the development of new life cycle assessment (LCA) applications for building systems, transportation systems, water systems, consumer products. Along with this he is studying the effects that slowly diffusing sustainable civil engineering innovations, and the social networks they diffuse through, can have on achieving long term sustainability goals.

ACADEMIC APPOINTMENTS

- Associate Professor, Civil and Environmental Engineering
- Senior Fellow, Stanford Woods Institute for the Environment

PROGRAM AFFILIATIONS

- Science, Technology and Society

PROFESSIONAL EDUCATION

- MBA, University of Michigan , Finance and Strategy (2008)
- PhD, University of Michigan , Civil and Environmental Engineering (2006)

Teaching

COURSES

2019-20

- Accounting, Finance & Valuation for Engineers & Constructors: CEE 244 (Sum)
- Damage and Failure Mechanics of Structural Systems: CEE 305 (Spr)
- Engineering Economics and Sustainability: CEE 146S, ENGR 60 (Aut, Spr, Sum)

- Introduction to PHD Studies in Civil and Environmental Engineering: CEE 379 (Aut)
- Life Cycle Assessment for Complex Systems: CEE 226 (Aut)

2018-19

- Damage and Failure Mechanics of Structural Systems: CEE 305 (Spr)
- Engineering Economics and Sustainability: CEE 146S, ENGR 60 (Aut, Spr, Sum)
- Introduction to PHD Studies in Civil and Environmental Engineering: CEE 379 (Aut)
- Life Cycle Assessment for Complex Systems: CEE 226 (Aut)

2017-18

- Damage and Failure Mechanics of Structural Systems: CEE 305 (Spr)
- Engineering Economics and Sustainability: CEE 146S, ENGR 60 (Aut, Win, Spr, Sum)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: CEE 126X (Aut)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: CEE 126Y (Win)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: CEE 126Z (Spr)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: EARTH 126X (Aut)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: EARTH 126Y (Win)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: EARTH 126Z (Spr)
- Introduction to PHD Studies in Civil and Environmental Engineering: CEE 379 (Aut)
- Life Cycle Assessment for Complex Systems: CEE 226 (Aut)

2016-17

- Damage and Failure Mechanics of Structural Systems: CEE 305 (Spr)
- Engineering Economics and Sustainability: CEE 146S (Sum)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: CEE 126X (Aut)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: CEE 126Y (Win)
- Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas: CEE 126Z, EARTH 126Z (Spr)
- Introduction to PHD Studies in Civil and Environmental Engineering: CEE 379 (Aut)
- Life Cycle Assessment for Complex Systems: CEE 226 (Aut)
- Stanford Sustainable Living Lab I: CEE 126A (Aut)
- Stanford Sustainable Living Lab II: CEE 126B (Win)

STANFORD ADVISEES

Lauren Esaki-Kua, Nick Reisweber

Doctoral Dissertation Reader (AC)

Forest Peterson, Yi Shao, Andrew Sonta, Tian Tan

Orals Chair

Robert Bremner

Postdoctoral Faculty Sponsor

Zhiye Li

Doctoral Dissertation Advisor (AC)

Adrian Biggerstaff, Weixuan Gao, Pouya Rezazadeh Kalehbasti, Isamar Rosa, Jie Wu

Master's Program Advisor

Zhiren Bao, Brandon Byers, Andrea Coto, Coco Coyle, Xingyu Li, Samantha Liu, Sanjana Paraz, Mike Suehisa, Jordan Wheeler

Doctoral (Program)

Basma Altaf, Isabella Douglas, Tess Hegarty, Jason Hernandez, Dehan Yu, Melissa Zirps

Publications

PUBLICATIONS

- **Cradle-to-gate sustainable target value design: integrating life cycle assessment and construction management for buildings** *JOURNAL OF CLEANER PRODUCTION*
Russell-Smith, S. V., Lepech, M. D.
2015; 100: 107-115
- **Integrating durability-based service-life predictions with environmental impact assessments of natural fiber-reinforced composite materials** *RESOURCES CONSERVATION AND RECYCLING*
Miller, S. A., Srubar, W. V., Billington, S. L., Lepech, M. D.
2015; 99: 72-83
- **Static versus Time-Dependent Material Selection Charts and Application in Wood Flour Composites** *JOURNAL OF BIOBASED MATERIALS AND BIOENERGY*
Miller, S. A., Lepech, M. D., Billington, S. L.
2015; 9 (2): 273-283
- **Techno-Ecological Synergy: A Framework for Sustainable Engineering** *ENVIRONMENTAL SCIENCE & TECHNOLOGY*
Bakshi, B. R., Ziv, G., Lepech, M. D.
2015; 49 (3): 1752-1760
- **Impact of progressive sustainable target value assessment on building design decisions** *BUILDING AND ENVIRONMENT*
Russell-Smith, S. V., Lepech, M. D., Fruchter, R., Littman, A.
2015; 85: 52-60
- **Sustainable target value design: integrating life cycle assessment and target value design to improve building energy and environmental performance** *JOURNAL OF CLEANER PRODUCTION*
Russell-Smith, S. V., Lepech, M. D., Fruchter, R., Meyer, Y. B.
2015; 88: 43-51
- **Incorporating spatiotemporal effects and moisture diffusivity into a multi-criteria materials selection methodology for wood-polymer composites** *CONSTRUCTION AND BUILDING MATERIALS*
Srubar, W. V., Miller, S. A., Lepech, M. D., Billington, S. L.
2014; 71: 589-601
- **A multi-objective feedback approach for evaluating sequential conceptual building design decisions** *AUTOMATION IN CONSTRUCTION*
Basbagill, J. P., Flager, F. L., Lepech, M.
2014; 45: 136-150
- **Firm-level ecosystem service valuation using mechanistic biogeochemical modeling and functional substitutability** *ECOLOGICAL ECONOMICS*
Comello, S. D., Maltais-Landry, G., Schwegler, B. R., Lepech, M. D.
2014; 100: 63-73
- **Probabilistic design and management of environmentally sustainable repair and rehabilitation of reinforced concrete structures** *CEMENT & CONCRETE COMPOSITES*
Lepech, M. D., Geiker, M., Stang, H.
2014; 47: 19-31
- **Application of multi-criteria material selection techniques to constituent refinement in biobased composites** *MATERIALS & DESIGN*
Miller, S. A., Lepech, M. D., Billington, S. L.

2013; 52: 1043-1051

- **Behavior of Concrete and ECC Structures under Simulated Earthquake Motion** *JOURNAL OF STRUCTURAL ENGINEERING-ASCE*
Gencturk, B., Elnashai, A. S., Lepech, M. D., Billington, S.
2013; 139 (3): 389-399
- **Network-Level Pavement Asset Management System Integrated with Life-Cycle Analysis and Life-Cycle Optimization** *JOURNAL OF INFRASTRUCTURE SYSTEMS*
Zhang, H., Keoleian, G. A., Lepech, M. D.
2013; 19 (1): 99-107
- **Application of life-cycle assessment to early stage building design for reduced embodied environmental impacts** *BUILDING AND ENVIRONMENT*
Basbagill, J., Flager, F., Lepech, M., Fischer, M.
2013; 60: 81-92
- **Improvement in environmental performance of poly(beta-hydroxybutyrate)-co-(beta-hydroxyvalerate) composites through process modifications** *JOURNAL OF CLEANER PRODUCTION*
Miller, S. A., Billington, S. L., Lepech, M. D.
2013; 40: 190-198
- **Durability of strain-hardening cement-based composites (SHCC)** *MATERIALS AND STRUCTURES*
Van Zijl, G. P., Wittmann, F. H., Oh, B. H., Kabele, P., Toledo Filho, R. D., Fairbairn, E. M., Slowik, V., Ogawa, A., Hoshiro, H., Mechtcherine, V., Altmann, F., Lepech, M. D.
2012; 45 (10): 1447-1463
- **Cradle-to-Gate Life Cycle Assessment for a Cradle-to-Cradle Cycle: Biogas-to-Bioplastic (and Back)** *ENVIRONMENTAL SCIENCE & TECHNOLOGY*
Rostkowski, K. H., Criddle, C. S., Lepech, M. D.
2012; 46 (18): 9822-9829
- **Human Health Impact as a Boundary Selection Criterion in the Life Cycle Assessment of Pultruded Fiber Reinforced Polymer Composite Materials** *JOURNAL OF INDUSTRIAL ECOLOGY*
Basbagill, J. P., Lepech, M. D., Ali, S. M.
2012; 16 (2): 266-275
- **Project-Level Assessment of Environmental Impact: Ecosystem Services Approach to Sustainable Management and Development** *JOURNAL OF MANAGEMENT IN ENGINEERING*
Comello, S. D., Lepech, M. D., Schwegler, B. R.
2012; 28 (1): 5-12
- **Multi-objective building envelope optimization for life-cycle cost and global warming potential** *9th European Conference on Product and Process Modelling*
Flager, F., Basbagill, J., Lepech, M., Fischer, M.
CRC PRESS-TAYLOR & FRANCIS GROUP.2012: 193-200
- **Structural modeling of corroded reinforced concrete bridge columns** *6th International Conference on Bridge Maintenance, Safety and Management (IABMAS)*
Rao, A. S., Lepech, M. D., Kiremidjian, A. S.
CRC PRESS-TAYLOR & FRANCIS GROUP.2012: 1008-1014
- **USING LIFE CYCLE ASSESSMENT METHODS TO GUIDE ARCHITECTURAL DECISION-MAKING FOR SUSTAINABLE PREFABRICATED MODULAR BUILDINGS** *JOURNAL OF GREEN BUILDING*
Faludi, J., Lepech, M. D., Loisos, G.
2012; 7 (3): 151-170
- **ECOLOGICAL PAYBACK TIME OF AN ENERGY-EFFICIENT MODULAR BUILDING** *JOURNAL OF GREEN BUILDING*
Faludi, J., Lepech, M.
2012; 7 (1): 100-119
- **INTEGRATED PROBABILISTIC LIFE CYCLE ASSESSMENT AND DURABILITY DESIGN FOR SUSTAINABLE SHCC INFRASTRUCTURE** *2nd International RILEM Conference on Strain Hardening Cementitious Composites (SHCC2-Rio)*
Lepech, M. D., Stang, H., Geiker, M.
R I L E M PUBLICATIONS.2011: 157-164

- **A Framework for Multiphysics Modeling of Natural Environments for Valuation of Privately Owned Ecosystem Services** *IEEE International Symposium on Sustainable Systems and Technology (ISSST)*
Comello, S. D., Lepech, M. D.
IEEE.2011
- **Life-Cycle Optimization of Pavement Overlay Systems** *JOURNAL OF INFRASTRUCTURE SYSTEMS*
Zhang, H., Keoleian, G. A., Lepech, M. D., Kendall, A.
2010; 16 (4): 310-322
- **Dynamic Life-Cycle Modeling of Pavement Overlay Systems: Capturing the Impacts of Users, Construction, and Roadway Deterioration** *JOURNAL OF INFRASTRUCTURE SYSTEMS*
Zhang, H., Lepech, M. D., Keoleian, G. A., Qian, S., Li, V. C.
2010; 16 (4): 299-309
- **Design of Sustainable Pavements Using Probabilistic LCA/Durability Design** *Proceedings of International Workshop on Energy and Environment in the Development of Sustainable Asphalt Pavements*
Lepech, M. D.
XIAN JIAOTUNG UNIV PRESS.2010: 16–21
- **Improving infrastructure sustainability using nanoparticle engineered cementitious composites** *International Conference on Advanced Concrete Materials (ACM)*
Lepech, M. D.
CRC PRESS-TAYLOR & FRANCIS GROUP.2010: 153–161
- **Time varying risk modeling of deteriorating bridge infrastructure for sustainable infrastructure design** *5th International Conference on Bridge Maintenance, Safety and Management (IABMAS)*
Rao, A. S., Lepech, M. D., Kiremidjian, A. S., Sun, X. Y.
CRC PRESS-TAYLOR & FRANCIS GROUP.2010: 2501–2508
- **Water permeability of engineered cementitious composites** *CEMENT & CONCRETE COMPOSITES*
Lepech, M. D., Li, V. C.
2009; 31 (10): 744-753
- **Application of ECC for bridge deck link slabs** *MATERIALS AND STRUCTURES*
Lepech, M. D., Li, V. C.
2009; 42 (9): 1185-1195
- **Introduction of Transition Zone Design for Bridge Deck Link Slabs Using Ductile Concrete** *ACI STRUCTURAL JOURNAL*
Qian, S., Lepech, M. D., Kim, Y. Y., Li, V. C.
2009; 106 (1): 96-105
- **Transition Zone Analysis and Design for Bridge Deck Link Slabs using Ductile Concrete** *ACI Structural Journal*
Qian, S., Lepech, M., Kim, Y., Y., Li, V., C.
2009; 1 (106): 96-105
- **Sustainable Infrastructure Systems using Engineered Cementitious Composites**
Lepech, M., D.
2009
- **Treatment of Uncertainties in Life Cycle Assessment**
Baker, J., W., Lepech, M.
2009
- **Improving Infrastructure Sustainability using Nanoparticle Engineered Cementitious Composites**
Lepech, M., D.
2009
- **Autogenous Healing of Engineered Cementitious Composites Under Wet-Dry Cycles** *Journal of Cement and Concrete Research*
Yang, Y., Lepech, M., D., Yang, E., H., Li, V., C.
2009; 39: 382-390

- **Design of Green Engineered Cementitious Composites for Improved Sustainability** *ACI MATERIALS JOURNAL*
Lepech, M. D., Li, V. C., Robertson, R. E., Keoleian, G. A.
2008; 105 (6): 567-575
- **Materials design for sustainability through life cycle modeling of engineered cementitious composites** *MATERIALS AND STRUCTURES*
Kendall, A., Keoleian, G. A., Lepech, M. D.
2008; 41 (6): 1117-1131
- **Design of green engineered cementitious composites for pavement overlay applications** *1st International Symposium on Life-Cycle Civil Engineering*
Lepech, M. D., Keoleian, G. A., Qian, S., Li, V. C.
CRC PRESS-TAYLOR & FRANCIS GROUP.2008: 837-842
- **Large Scale Processing of Engineered Cementitious Composites** *ACI Materials Journal*
Lepech, M., D., Li, V., C.
2008; 4 (105): 358-366
- **An integrated life cycle assessment and life cycle analysis model for pavement overlay systems** *1st International Symposium on Life-Cycle Civil Engineering*
Zhang, H., Keoleian, G. A., Lepech, M. D.
CRC PRESS-TAYLOR & FRANCIS GROUP.2008: 907-912
- **Integrated Structure and Materials Design for Sustainable Concrete Transportation Infrastructure**
Lepech, M., Keoleian, G., A., Li, V., C.
2007
- **Incorporating Life Cycle Analysis into Early Stage Office Furniture Product Development** *International Life Cycle Assessment and Management 2007.*
Conway, C., Lepech, M., VanValkenburg, D., Youngs, B.
2007
- **Guiding the design and application of new materials for enhancing sustainability performance: Framework and infrastructure application** *Symposium on Life-Cycle Analysis Tools for Green Materials and Process Selection held at the 2005 MRS Fall Meeting*
Keoleian, G. A., Kendall, A. M., Lepech, M. D., Li, V. C.
MATERIALS RESEARCH SOCIETY.2006: 123-134
- **Sustainable Infrastructure Engineering: Integrating Material and Structural Design with Life Cycle Analysis** *Advances in Cement and Concrete X: Sustainability*
Lepech, M., Li, V., C.
edited by Schrivener, K., Monteiro, P., Hanehara, S.
ECI.2006: 55-60
- **Long Term Durability Performance of Engineered Cementitious Composites** *International Journal for Restoration of Buildings and Monuments*
Lepech, M., D., Li, V., C.
2006; 2 (12): 119-132
- **Durability and Long Term Performance of Engineered Cementitious Composites**
Lepech, M., Li, V., C.
2006
- **General Design Assumptions for Engineered Cementitious Composites**
Li, V., C., Lepech, M.
2006
- **Life Cycle Modeling of Concrete Bridge Design: Comparison of Engineered Cementitious Composite Link Slabs and Conventional Steel Expansion Joints** *JOURNAL OF INFRASTRUCTURE SYSTEMS*
Keoleian, G. A., Kendall, A., Dettling, J. E., Smith, V. M., Chandler, R. F., Lepech, M. D., Li, V. C.
2005; 11 (1): 51-60
- **Water Permeability of Cracked Cementitious Composites**
Lepech, M., Li, V.
2005

- **Life-Cycle Cost Model for Evaluating the Sustainability of Bridge Decks**
Keoleian, G., A., Kendall, A., Chandler, R., F., Helfand, G., Lepech, M., D., Li, V., C.
2005
- **Life Cycle Model for Evaluating the Sustainability of Concrete Infrastructure Systems**
Keoleian, G., Kendall, A., Chandler, R., Helfand, G., Lepech, M., Li, V., C.
2005
- **Design and Field Demonstration of ECC Link Slabs for Jointless Bridge Decks**
Lepech, M., Li, V., C.
2005
- **Sustainable Infrastructure Material Design**
Lepech, M., Li, V., C., Keoleian, G.
2005
- **Self -healing of ECC under cyclic wetting and drying**
Yang, Y., Lepech, M., Li, V.
2005
- **Self-healing in Cementitious Compounds** *Self-healing Materials Workshop*
Li, V., C., Lepech, M.
edited by aan Zee, N.
Delft, Netherlands.2005: 1
- **Life Cycle Modeling of Concrete Bridge Design: Comparison of ECC Link Slabs and Conventional Steel Expansion Joints** *Journal of Infrastructure Systems*
Keoleian, G., A., Kendall, A., Dettling, J., E., Smith, V., M., Chandler, R., F., Lepech, M., D.
2005: 51-60
- **Development of green engineered cementitious composites for sustainable infrastructure systems** *International Workshop on Sustainable Development and Concrete Technology*
Li, V. C., Lepech, M., Wang, S. X., Weimann, M., Keoleian, G.
CENTER TRANSPORTATION RESEARCH & EDUCATION.2004: 181-191
- **Development of Green ECC for Sustainable Infrastructure Systems.**
Li, V., C., Lepech, M., Wang, S., Weimann, M., Keoleian, G.
edited by Wang, K.
2004
- **Size Effect in ECC Structural Members in Flexure**
Lepech, M., Li, V., C.
2004
- **Crack Resistant Concrete Material for Transportation Construction** *Transportation Research Board 83rd Annual Meeting Compendium of Papers, Paper No. 04-4680.*
Li, V., C., Lepech, M.
2004
- **Preliminary Findings on Size Effect in ECC Structural Members in Flexural**
Lepech, M., Li, V., C.
2003